THE AMERICAN JOURNAL of PSYCHIATRY

VOLUME 112
NUMBER 2
AUG. 1955

Official Organ of
THE AMERICAN PSYCHIATRIC ASSOCIATION

1956 Annual Meeting, Hotel Morrison, Chicago, Illinois, April 30–May 4, 1956

ADJUNCTIVE CHEMO-PSYCHOTHERAPY . . . *in tablet form*

Creates sense of well-being, increasing rapport and receptiveness to psychotherapy

Crystalline Alkaloid Therapy
Serpanray
reserpine, 'Panray'

Whole Root Therapy
KOGLUCOID
rauwolfia serpentina, 'Panray'

Supplemental Therapy for NEURO-PSYCHIATRIC CONDITIONS

- Calms hyperactive patients, quiets the noisy, alerts the depressed
- Often precludes electroshock, seclusion and barbiturates
- Tranquilizes and sedates without affecting alertness or responsiveness
- Allows natural sleep
- Clinically proven in anxiety-tension states, compulsive, and other behavioristic disorders
- Non-addictive and well tolerated for prolonged treatment

KOGLUCOID
rauwolfia serpentina, 'Panray'
Supplied in 50 mg. and 100 mg. coated tablets.

Serpanray
reserpine, 'Panray'
Supplied in 0.1 mg., 0.25 mg., 0.5 mg., 1.0 mg., 2.0 mg. and 4.0 mg. compressed, scored tablets. Also available in 2 cc ampules containing 2.5 mg. or 5.0 mg. per cc, for parenteral administration.

Now at a realistic price level, for general hospital use.

Write for samples, literature

THE Panray CORP. 340 CANAL STREET, NEW YORK 13, N. Y.

Bottles of 100, 500, 1,000 and bulk packing.

Sole Canadian Distributors:
Wisley-Morris Co., 6379 Somerled Ave., Montreal 29, P.Q.

© 1955 The Panray Corp., New York, N. Y.

THE AMERICAN JOURNAL OF PSYCHIATRY

VOLUME 112 AUGUST 1955 No. 2

EDITOR

CLARENCE B. FARRAR, M. D., 216 St. Clair Avenue West, Toronto 5, Ont.

BUSINESS MANAGER

AUSTIN M. DAVIES, PH. B., 1270 Avenue of The Americas, New York 20, New York

ASSOCIATE EDITORS

WILLIAM RUSH DUNTON, JR., M. D.
FRANKLIN G. EBAUGH, M. D.
STANLEY COBB, M. D.
WILLIAM C. SANDY, M. D.
LEO KANNER, M. D.
LAUREN H. SMITH, M. D.
KARL M. BOWMAN, M. D.
WALTER L. TREADWAY, M. D.
JOHN C. WHITEHORN, M. D.
S. SPAFFORD ACKERLY, M. D.
LAWSON G. LOWREY, M. D.
PAUL H. HOCH, M. D.

EDITORIAL ASSISTANT

SHEILA M. MARTINSEN, B. A.

FORMER EDITORS, 1844–1931

AMARIAH BRIGHAM, M. D., Founder, 1844–1849

T. ROMEYN BECK, M. D.
JOHN P. GRAY, M. D.
G. ALDER BLUMER, M. D.
RICHARD DEWEY, M. D.
HENRY M. HURD, M. D.
EDWARD N. BRUSH, M. D.

Published by

THE AMERICAN PSYCHIATRIC ASSOCIATION

1601 EDISON HIGHWAY, BALTIMORE 13, MD.

AMERICAN JOURNAL OF PSYCHIATRY

INFORMATION FOR CONTRIBUTORS

Manuscripts—The *original* manuscripts of papers read at the annual meetings of the Association should be deposited with the Secretary during the meetings, or sent to the New York office promptly afterward. Do not deposit carbon copies.

Papers read at the annual meetings become the property of the Association. Not all papers read, however, can be published in the JOURNAL, and authors wishing to publish in other vehicles will first secure from the Editor the release of their manuscripts.

Papers will not be accepted for the annual program if they have been previously read at other meetings or if they have been already published.

Papers contributed during the year (not on the annual program) should be sent to the Editor, Dr. Clarence B. Farrar, 216 St. Clair Avenue West, Toronto 5, Ontario, Canada.

Style—Manuscripts should be typewritten, double spaced, on one side of paper. They must be prepared in conformity with the general style of The American Journal of Psychiatry. Retain a carbon copy of manuscript and duplicates of tables, figures, etc., for use should the originals be lost in the mails.

Multiple Authorship—The number of names listed as authors should be kept to a minimum, others collaborating being shown in a footnote.

Illustrations—Authors will be asked to meet printer's costs of reproducing illustrative material. Copy for illustrations cannot be accepted unless properly prepared for reproductions. Wherever possible, drawings and charts should be made with India ink for photographic reproduction as zinc etchings. Photographs for halftone reproduction should be glossy prints. Illustrations should be as small as possible without sacrificing important detail. Redrawing or preparing illustrations to make them suitable for photographic reproduction will be charged to author.

Authors' Corrections in Proofs—Corrections, additions or deletions made by authors are to be charged to them. These alterations are charged on a time basis at the rate of $3.00 per hour. Proper editing of original manuscript is important to avoid the expense of correction.

Tables—Tables should be typed and on separate sheets. Tables are much more expensive to set than text material and should be used only where necessary to clarify important points. Authors will be asked to defray cost of excessive tabular material.

References—References should be assembled according to author in a terminal bibliography, referred to in text by numbers in parentheses. Bibliographical material should be typed in accordance with the following style for journals and books respectively:

1. Vander Veer, A. H., and Reese, H. H. Am. J. Psychiat., 95:271, Sept. 1938.
2. Hess, W. R. Diencephalon. New York: Grune & Stratton, 1954.

Abbreviations should conform to the style used in the Quarterly Cumulative Index Medicus.

The American Journal of Psychiatry, formerly The American Journal of Insanity, the official organ of The American Psychiatric Association, was founded in 1844. It is published monthly, the volumes beginning with the July number.

The subscription rates are $12.00 to the volume: Canadian subscriptions, $12.50; foreign subscriptions, $13.00, including postage. Rates to medical students, junior and senior internes, residents in training during their first, second, or third training year, and also to graduate students in psychology, psychiatric social work, and psychiatric nursing, $5.00 (Canada $5.50). Single issues, $1.25.

Copyright 1955 by The American Psychiatric Association

Office of Publication, 1601 Edison Highway, Baltimore 13, Md.

Editorial communications, books for review, and exchanges should be addressed to the Editor, Dr. Clarence B. Farrar, 216 St. Clair Avenue West, Toronto 5, Ontario, Canada.

Business communications, remittances and subscriptions should be addressed to The American Psychiatric Association, 1601 Edison Highway, Baltimore 13, Md., or to 1270 Avenue of the Americas, New York 20, N. Y.

Entered as second class matter July 31, 1911, at the post office at Baltimore, Maryland, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917. Authorized on July 3, 1918.

AUGUST

CONTENTS

1955

THE ACADEMIC LECTURE. The Biological Roots of Psychiatry. *R. W. Gerard* 81

EMOTIONAL AND PSYCHOLOGICAL FACTORS IN EPILEPSY: PHYSIOLOGICAL BACKGROUND. *W. T. Liberson* 91

AN EVALUATION OF CARBON DIOXIDE THERAPY. *Albert A. Lal'erne and Morris Herman* .. 107

PHYSIOLOGICAL CONCOMITANTS OF THE PHASIC DISTURBANCES SEEN IN PERIODIC CATATONIA. *A. Bonkalo, J. W. Lovett Doust, and A. B. Stokes* 114

MARGINAL MANPOWER IN THE MILITARY FORCES. *E. L. Caveny* 123

SCHIZOPHRENIA IN THE YOUNGEST MALE CHILD OF THE LOWER MIDDLE CLASS. *Bertram H. Roberts and Jerome K. Myers* 129

AN EVALUATION OF SUBCOMA INSULIN THERAPY. *Donald C. Greaves, Peter F. Regan, III, and Louis J. West* 135

VAGOTOMY—FIVE YEARS LATER. *William M. Shanahan* 140

CASE REPORT:

Cushing's Syndrome and Its Management. *Philip E. Hertz, Endre Nadas, and Henry Wojtkowski* 144

HISTORICAL NOTE:

August Homburger: Pioneer in Child Psychiatry 146

COMMENTS:

Birthday Tribute to Cécile and Oskar Vogt 149
Instincts 149

NEWS AND NOTES:

Canadian and Ontario Psychiatric Associations, 152. Dr. Treadway Honored, 152. Egyptian Child Welfare Bureau, 152. Dr. Hargreaves Goes to the University of Leeds, 153. Dr. Hoch Receives Adolf Meyer Award, 153. Hirschhorn Gift to New York School of Social Work, 153. Dr. Tompkins Head of Psychiatry at St. Vincent's Hospital (New York City), 153. Psychotherapy in Psychosomatic Problems, 153. Sixth Annual North Shore Health Resort Lecture Series, 154. National Multiple Sclerosis Society, 154. Illinois Psychiatric Society, 154. Nassau (New York) District Branch, 154. Eastern Group Psychotherapy Association, 154. New York Academy of Medicine Annual Fortnight, 154. Volunteers in Mental Hospitals, 154. American Group Psychotherapy Association Western Regional Meeting, 154. WHO Reports on Drugs, 155. Recent Advances in the Maze Test, 155. Archives of Criminal Psychodynamics, 155.

BOOK REVIEWS:

The Meaning of Social Medicine. *Iago Galdston* 156
The Construction of Reality in the Child. *Jean Piaget* 156
Hyperostosis Cranii. *Sherwood Moore* 157
The Peptic Ulcer Individual. *Gerdt Wretmark* 158
Manual of Psychological Medicine for Practitioners and Students. Third Edition. *A. F. Tredgold and R. F. Tredgold* 158
Treasury of Philosophy. *Dagobert D. Runes, ed.* 160

THE AMERICAN PSYCHIATRIC ASSOCIATION

OFFICERS 1955–1956

President: R. Finley Gayle, Jr., M. D. — *President-Elect:* Francis J. Braceland
Secretary: William Malamud, M. D. — *Treasurer:* Jack R. Ewalt, M. D.

COUNCILLORS

For 3 years	For 2 years	For 1 year
Herbert S. Gaskill, M. D.	Douglas W. Orr, M. D.	Maurice Levine, M. D.
Harvey J. Tompkins, M. D.	George N. Raines, M. D.	Paul L. Schroeder, M. D.
S. Bernard Wortis, M. D.	Raymond W. Waggoner, M. D.	Henry A. Davidson, M. D.
Arthur P. Noyes, M. D.	Kenneth E. Appel, M. D.	D. Ewen Cameron, M. D.

EXECUTIVE COMMITTEE

Arthur P. Noyes, M. D. — William Malamud, M. D.
R. Finley Gayle, Jr., M. D. — Jack R. Ewalt, M. D.
Harvey J. Tompkins, M. D. — D. Ewen Cameron, M. D.

ASSEMBLY OF DISTRICT BRANCHES

Addison M. Duval (Speaker) — Matthew Ross (Deputy Speaker) — John R. Saunders (Recorder)

MEDICAL DIRECTOR

Daniel Blain, M. D., 1785 Massachusetts Avenue, N. W., Washington, D. C.

EXECUTIVE ASSISTANT

Austin M. Davies, Ph. B., 1270 Avenue of the Americas, New York 20, N. Y.

CHAIRMEN OF COMMITTEES

ANNUAL COMMITTEES

Arrangements
Paul E. Nielson

Nominating
David C. Wilson

STANDING COMMITTEES
(Internal Activities of Association)

Budget
Robert H. Felix

Constitution and By-Laws
Henry Davidson

Ethics
S. Spafford Ackerly

Membership
Joseph E. Barrett

Program
Titus Harris

Resolutions
James H. Wall

STANDING COMMITTEES
(Technical Aspects)
Frank J. Curran, Coordinating Chairman

Child Psychiatry
George E. Gardner

History of Psychiatry
Robert S. Bookhammer

Medical Education
Milton Rosenbaum

Medical Rehabilitation
Benjamin Simon

Public Health
Charles A. Roberts

Research
Jacques Gottlieb

Therapy
Paul Hoch

STANDING COMMITTEES
(Professional Standards)
Wilfred Bloomberg Coordinating Chairman

Relations with Psychology
Paul Huston

Legal Aspects of Psychiatry
Gregory Zilboorg

Nomenclature and Statistics
Moses Frohlich

Psychiatric Hospital Standards and Policies
Harvey Tompkins

Psychiatric Nursing
Granville Jones

Psychiatric Social Service
Benjamin Boshes

Private Practice
John M. Cotton

STANDING COMMITTEES
(Community Aspects)
William C. Menninger, Coordinating Chairman

Academic Education
Dana Farnsworth

Industrial Psychiatry
Ralph T. Collins

International Relations
Iago Galdston

Cooperation with Leisure Time Agencies
Alexander R. Martin

National Defense
Joseph S. Skobba

Preventive Psychiatry
Lloyd J. Thompson

Public Information
Robert Morse

Veterans
David J. Flicker

A NEW EMOTIONAL STABILIZER FOR NEUROPSYCHIATRIC THERAPY

Serpasil, in a recent study,[1] proved to be a valuable supplement in the treatment of various neuropsychiatric disorders. In many instances it eliminated the need for electroshock therapy, restraints, seclusion and barbiturate sedation.

Combative, uncooperative patients in general became friendly, cooperative, cheerful, sociable and more amenable to psychotherapy under Serpasil. Hyperactive patients became sedate, noisy patients quiet, depressed patients alert.

Serpasil produced remissions in 20 of the 74 patients studied. Eight were discharged from the hospital.

If extended studies confirm preliminary findings, the authors state, Serpasil will be one of the most important therapeutic developments in the history of psychiatry.

Supplied

Tablets, 1.0 and 0.25 mg. (scored) and 0.1 mg.
Elixir, 0.2 mg. Serpasil per 4-ml. teaspoonful.

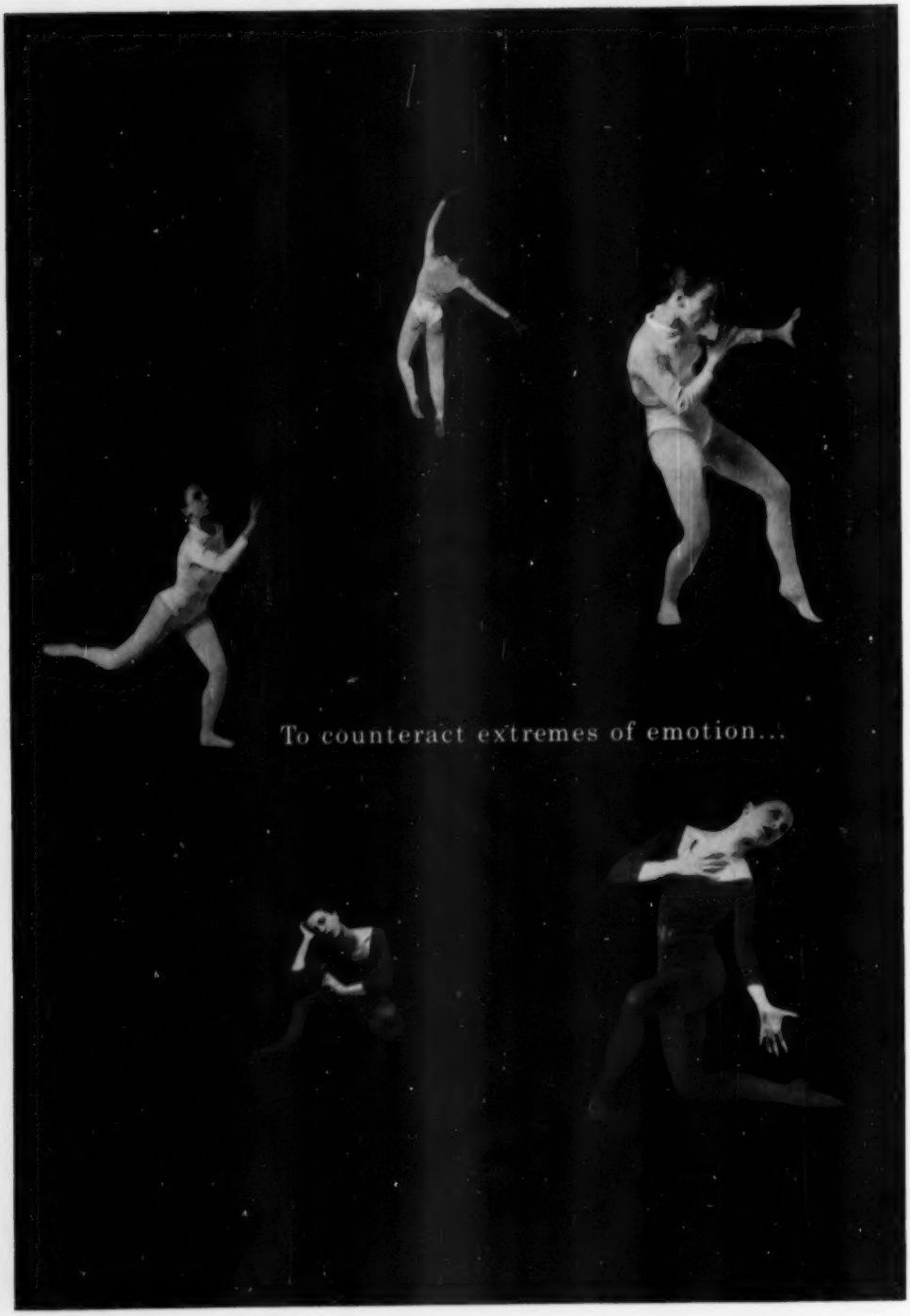
For neuropsychiatric use only:

Parenteral Solution, 2-ml. ampuls, 2.5 mg. Serpasil per ml.
Tablets, 4.0 and 2.0 mg.

1. Noce, R. H., Williams, D. B., and Repaport, W.: J. A. M. A. 156:821 (Oct. 30) 1954.

Serpasil®
(reserpine CIBA)

CIBA
SUMMIT, N. J.


To counteract extremes of emotion...

Desbutal®

DESOXYN® *to brighten the mood*

NEMBUTAL® *to relax inner tensions*

One capsule represents 5 mg. DESOXYN Hydrochloride (Methamphetamine Hydrochloride, Abbott) plus 30 mg. NEMBUTAL Sodium (Pentobarbital Sodium, Abbott). Bottles of 100 and 1,000 capsules. Abbott

DAB100

RESERPINE

In Nervous and Mental Disorders

THE RIKER BRAND OF RESERPINE

Serpiloid®

is available in a wide range of dosage forms for ambulatory and institutionalized patients

Serpiloid Tablets (ORAL)

are available in the following strengths: 0.25, 1, 2, 3 and 5 mg. each.

Serpiloid Intramuscular

is available in 2 cc. ampuls, containing 2.5 mg. per cc. and 5 mg. per cc., respectively.

Quotations for institutional quantities supplied on request.

Riker LABORATORIES, INC. LOS ANGELES 54, CALIF.

"MYSOLINE"

may forestall detonation

in epilepsy

NOTABLE RESULTS REPORTED WITH "MYSOLINE" IN 63 PER CENT OF PATIENTS REFRACTORY TO OTHER ANTICONVULSANTS.

The Doyle and Livingston report* covers 100 patients, mostly children, the majority ranging in age from 2 to 14 years. In 64 the epilepsy was of idiopathic origin, and in 36 it was due to organic causes. Other anticonvulsants in maximum dosages had proved ineffective in 81 of these patients for at least one year previously.

In 42 of the 81 patients who had been receiving other anticonvulsants, transition to "Mysoline" alone was completed in about 2 months; the other 39 were continued on combination therapy throughout the observation period (from 3 months to 1 year). The daily dose of "Mysoline" ranged from 0.375 Gm. to 1.5 Gm., depending on the age of the patient.

Results of therapy: "Mysoline" therapy benefited 63 per cent of the 100 patients; seizures were entirely controlled in 30, markedly reduced in 20, and moderately reduced in 13. Grand mal attacks were completely controlled in 30 of 51 patients with this type of seizure. The response in patients with petit mal, minor, or psychomotor seizures was less favorable.

Side effects: Routine blood counts and urinalyses were made on every patient and showed no abnormality at any time. No serious side reactions were observed. Drowsiness occurred in 19 per cent of the patients, sometimes with minor disturbances of equilibrium, but these side effects generally disappeared spontaneously within a few weeks.

*Doyle, P. J., and Livingston, S.: *J. Pediat.* *43*:413 (Oct.) 1953.

Ayerst Laboratories • New York, N. Y. • Montreal, Canada

Ayerst

Ayerst Laboratories make "Mysoline" available in the United States by arrangement with Imperial Chemical (Pharmaceuticals) Limited. 5564

"MYSOLINE" HAS PROVED CLINICALLY VALUABLE IN PREVENTING THE "DETONATION"† WHICH LEADS TO GRAND MAL AND PSYCHOMOTOR SEIZURES.

"Mysoline" constitutes "a valuable addition to the medical treatment of epilepsy. It is most convincingly effective in grand mal, and present evidence suggests it may prove more beneficial than most drugs used for the psychomotor group . . ."

Editorial: Brit. M. J. *1*:1028 (May 1) 1954.

"Mysoline" appears to be a "relatively nontoxic drug and it did not produce any known serious side effects in a group of 48 patients." When drowsiness, dizziness, and slight ataxia were noted "these complaints ceased after reduction of the dosage. Consequently, after the proper dose was established, 'Mysoline' was well tolerated without side effects."

Pence, L. M.: Texas State J. Med. *50*:290 (May) 1954.

COMPOSITE RESULTS OF 20 CLINICAL STUDIES

EPILEPTIC PATIENTS HAD FAILED TO RESPOND SUCCESSFULLY TO OTHER ANTICONVULSANTS

"Mysoline" was added to current medication which, in some cases, was eventually replaced by "Mysoline" alone.

Type of Seizure	No. of Patients	Completely Controlled	50-90% Improved	Less than 50%
Grand Mal	613	175 (28.5%)	253 (41.2%)	185 (30.3%)
Psychomotor	130	10 (7.7%)	65 (50%)	55 (42.3%)

EPILEPTIC PATIENTS HAD RECEIVED NO OTHER MEDICATION

"Mysoline" alone was employed.

Type of Seizure	No. of Patients	Completely Controlled	50-90% Improved	Less than 50%
Grand Mal	214	172 (80%)	15 (7%)	27 (13%)
Psychomotor	29	19 (65%)		10 (35%)

†"Seizure discharge, the physiological basis of clinical epilepsy, is a process by which 'a portion of the cerebral nerve network (is converted) from a submaximally active asynchronous mosaic with an internal self-regulating inhibitory system to a maximally active hyperdischarging and hypersynchronized functional unit capable of detonating other regions of the brain with which it has connection'."

Kaufman, I. C., and Isenberg, S.: M. Clin. North America *36*:1381 (Sept.) 1952.

SEE NEXT PAGE FOR COMPLETE DOSAGE SCHEDULES

Suggested Dosage Schedules

Adults and children over 8 years: *In patients receiving no other anticonvulsants:* "Mysoline" therapy is started with 0.25 Gm. daily, and dosage is gradually increased at weekly intervals, until maximum therapeutic effect is achieved.

Order of Dosage Increase for Adults and Children Over 8 Years

1st week	2nd week	3rd week	4th week
0.25 Gm. (1 tablet) daily, at bedtime	0.5 Gm. (2 tablets) daily, 1 on arising, 1 at bedtime	0.75 Gm. (3 tablets) daily, in 3 divided doses	1 Gm. (4 tablets) daily, in 4 divided doses

When dosage is increased beyond 1 Gm., the daily intake is administered in four divided doses, and increments of 0.25 Gm. are added at weekly intervals as indicated above. Children 8 years and older are usually able to tolerate the same dosage as adults. ("Mysoline" is not recommended for use in dosages over 2 Gm. daily.)

In patients already receiving other anticonvulsants: "Mysoline," 0.25 Gm., is given daily and dosage is gradually increased, while the dosage of the other drug(s) is gradually decreased.

Children up to 8 years of age: 0.125 Gm. is administered on the same basis of therapy as suggested for adults. (In many cases control has been achieved with 0.375 Gm. to 0.75 Gm. daily.)

Supplied: No. 3430 – 0.25 Gm. tablets (scored). Bottles of 100 and 1,000.

A REPRINT OF THE DOYLE AND LIVINGSTON REPORT ABSTRACTED HEREIN MAY BE OBTAINED ON REQUEST. DESCRIPTIVE LITERATURE ON "MYSOLINE" IS ALSO AVAILABLE.

Calm, Relaxed AND *Awake*

MEBARAL®

BRAND OF MEPHOBARBITAL

WINTHROP

for the hyperexcitability so often found in

hypertension
hyperthyroidism
convulsive disorders
difficult menopause
psychoneurosis
hyperhidrosis

Mebaral's soothing sedative effect is obtained without significantly clouding the patient's mental faculties.

Average Dose:

Adults—32 mg. to 0.1 Gm. (optimal 50 mg.), 3 or 4 times daily.

Children—16 to 32 mg., 3 or 4 times daily.

Tasteless tablets of 32 mg. (½ grain)
50 mg. (¾ grain)
0.1 Gm. (1½ grains)
0.2 Gm. (3 grains) scored.

WINTHROP-STEARNS INC. New York 18, N.Y. • Windsor, Ont.

Mebaral, Trademark reg. U. S. Pat. Off.

WALKIE-RECORDALL

WORLD'S ONLY RECORDER OF ITS KIND

LIGHTWEIGHT • SELF-POWERED

NO WIRES OR PLUGS

specially designed for the psychiatrist to meet his every need

MODEL "CCB"
TOTAL WEIGHT—
9 LBS.
(including briefcase)
Ready to operate
in or out of closed
briefcase

RECORD AUTOMATICALLY AND WITHOUT SUPERVISION WHEREVER YOU CARRY OR PLACE THE BRIEFCASE

Automatic Undetected Recordings up to 4 hrs.

The self-powered Walkie-Recordall permits you to make unsupervised recordings automatically—anytime, anyplace—in or out of the office—while walking, riding or flying—without connecting to electric socket. The miniature Walkie-Recordall weighs only 8 lbs., including self-contained standard batteries. Provision available also for operation from 110 v. A.C. May be had with Miles Standard Briefcase. Walkie-Recordall picks up and records consultations, lectures, diagnosis and interviews in or out of closed briefcase.

Sensitivity Range -- 60 ft. radius

Walkie-Recordall picks up and records within a 60-ft radius in or out of closed briefcase. The Automatic Voice Equalizer assures equal voice volume within the sensitivity range. Monitoring provision from microphone or telephone available. Minimizes outside noises and disturbances such as typing, air conditioner, car motor, airplane engine.

Voice Activated "Self-Start-Stop" Eliminates Supervision

Using this control, recording is automatically and instantly started upon the activation of voice vibrations and stops, automatically, within 8 seconds after voice ceases. The recording of silent periods is completely eliminated. This feature is particularly desirable when, for particular reason, Walkie-Recordall is left in a room with an unattended patient.

Case History Simplification

A case history file may be compiled of Sonabands, the recording medium, that cost as low as 3¢ per hour for unalterable recordings that may be filed for permanent future reference. The unique indexing arrangement permits the immediate location for playback of any part of previously recorded text. Subsequent recordings may be accurately started where the last recording ended. Thus recordings may be accumulated at intervals on a single Sonaband having a recording capacity up to 4 hours. Self-aligning Sonabands, the endless film belts, go on and off the recorder in a jiffy. Using Walkie-Recordall, time-consuming and expensive transcriptions may be eliminated by direct reference to the indexed Sonabands. Unalterable Sonabands last indefinitely, cannot be accidentally or otherwise erased, and are resistant to weather, water, dust, shrinkage and combustion. Flexible Sonabands are easily marked and compactly filed in metal containers measuring 1 by 3 by 6 inches which hold 150 hours of recording.

Telephone Recordings

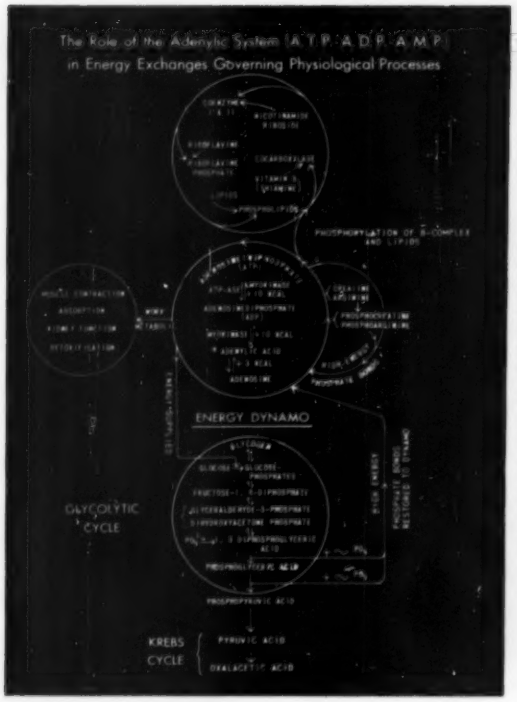
When using Miles Telemike, Walkie-Recordall will record two-way telephone conversation.

WALKIE-RECORDALL — a product of 30 years of research

For literature and price list write Dept. AJP-6

MILES REPRODUCER COMPANY, INC.

812 BROADWAY • NEW YORK 3, N. Y. • SPring 7-7670



THE ADENYLIC NUCLEOTIDES

Gradually the role of the Adenylic Nucleotides is being clarified. Their versatility and importance both physiologically and in clinical medicine is leading to applications in an expanding number of clinical indications.*

We have available the following adenylic nucleotides in one cc ampuls:

IRONYL ®

IRON ADENOSINE-3-MONOPHOSPHATE

Each one cc ampul contains 32.4 mg. of Ferrous Adenylate equivalent to 28 mg. of adenosine-3-monophosphate and 4.4 mg. of ferrous iron.

Available in boxes of 10, 25 and 100 ampuls

Each Sublingual Tablet contains 32.4 mg. of Ferrous Adenylate equivalent to 28 mg. of adenosine-3-monophosphate and 4.4 mg. of iron.

Available in boxes of 12, 25 and 250 tablets

MUSANYL®

IRON ADENOSINE-5-MONOPHOSPHATE

Each one cc ampul contains 32.4 mg. of Ferrous Adenylate equivalent to 28 mg. of adenosine-5-monophosphate and 4.4 mg. of ferrous iron.

Ampuls in boxes of 10s, 25s and 100s

AVAILABLE ONLY TO THE CLINICAL INVESTIGATOR:

PROCANYL®	PROCAINE ADENOSINE-3-MONOPHOSPHATE. Each one cc ampul contains 50 mg. of Procaine Adenylate equivalent to 30 mg. of adenosine-3-monophosphate and 20 mg. (2%) of procaine.
NICOTINAMIDE ADENYLATE	NICOTINAMIDE ADENOSINE-3-MONOPHOSPHATE. Each one cc ampul contains 52 mg. of Nicotinamide Adenylate equivalent to 22 mg. of nicotinamide and 30 mg. of adenosine-3-monophosphate.
NIKETHAMIDE ADENYLATE	NIKETHAMIDE ADENOSINE-3-MONOPHOSPHATE. Each one cc ampul contains 80 mg. of Nikethamide Adenylate equivalent to 50 mg. of Nikethamide and 30 mg. of adenosine-3-monophosphate.
NATRI-A. T. P.	SODIUM ADENOSINE-5-TRIPHOSPHATE. Each one cc ampul contains 10.67 mg. of Sodium Adenosine-5-Triphosphate equivalent to 9 mg. of Adenosine-5-Triphosphate and 1.67 mg. of sodium.

*** An annotated Bibliography, "Abstracts on the Adenylic Nucleotides with particular reference to Yeast Adenylic Acid (Adenosine-3-Monophosphate)" is available on request.**

PHYSIOLOGICAL CHEMICALS CO., INC.

3 LE FEVRE LANE

NEW ROCHELLE, NEW YORK

The right windows make a REAL DIFFERENCE . . .

NO "BARRED LOOK" HERE!

The Fenestra* Psychiatric Package Window unit helps create the homelike atmosphere and pleasant surroundings so important in modern mental therapy.

With the attractive appearance of the modern, awning-type window seen in many homes, there is nothing to suggest restraint. The "barred look" is completely absent. The protection is where it should be—in the window's design, and in its covering screen.

Besides the steel window itself, the Fenestra Psychiatric Package Window unit includes steel casings, operating hardware (bronze adjuster handle is removable), and the choice of three specialized, flush-mounted, inside screens. (1) A *Detention Screen* gives maximum restraint. The finest stainless steel mesh is attached to strong, concealed shock absorbers. (2) A *Protection Screen*, without shock absorbers, is used for less disturbed patients. (3) An *Insect Screen* is used for windows in nonrestraint areas.

Basically designed for protection of the patient, the Fenestra Psychiatric Window presents no projecting parts to encourage climbing. There are no sharp corners. The patient cannot get at the glass. All-weather ventilation is controlled without touching the screen. Window is washed inside and out, from within the room.

To eliminate maintenance-painting, Fenestra Windows are available Super Hot-Dip Galvanized, from America's only plant specifically designed for hot-dip galvanizing of steel windows.

Only Fenestra completely fabricates a window unit of this type. For complete details, call the Fenestra Representative, listed in your classified telephone directory, or write Detroit Steel Products Company, Dept. AJ-2, 2276 East Grand Blvd., Detroit, Michigan. **

Architectural, Residential and Industrial Windows • Metal Building Panels • Electrifloor* • Roof Deck • Hollow Metal Swing and Slide Doors

Fenestra | PSYCHIATRIC PACKAGE WINDOWS

Upjohn

Relax

the nervous,
tense,
emotionally unstable:

Reserpoid *(Pure crystalline alkaloid)*

TRADEMARK FOR THE UPJOHN BRAND OF RESERPINE

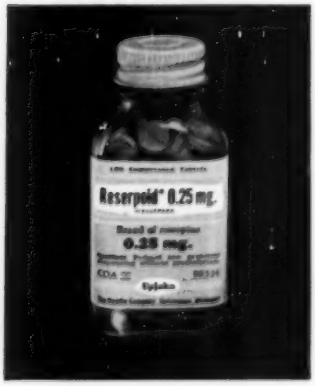
Each tablet contains:

Reserpine . . . . . 0.1 mg.
or 0.25 mg.
or 1.0 mg.

Supplied:

Scored tablets
0.1 and 0.25 mg. in bottles of 100 and 500
1.0 mg. in bottles of 100

The Upjohn Company, Kalamazoo, Michigan



MODEL G
Electroencephalograph

For
Ruggedness,
Dependability
and
Better Fidelity

All Steel Console

Stainless Steel dial plates and table top

No "B" batteries or wet batteries

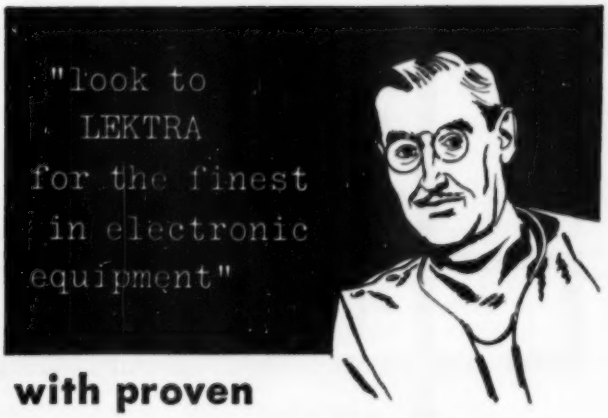
MODEL FA-1
Combined ECT-Stimulator

Providing the advantages of both therapies
write for particulars

MEDCRAFT
ELECTRONIC CORP.
426 GREAT EAST NECK ROAD
BABYLON, N. Y.

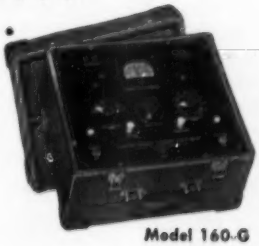
Designers and Manufacturers of Diagnostic and Therapeutic Equipment for the medical profession.

Telephone: MOhawk 9-2837
Cable: Medcraft Babylon NY

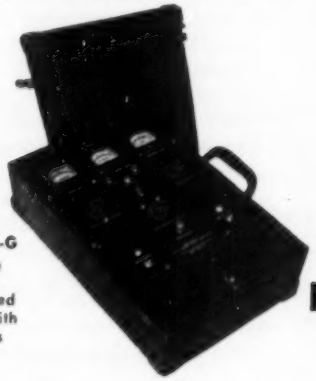


Electro-Shock Therapy with proven GLISSANDO TREATMENT

reduces severity of convulsion . . .
reduces chance of fracture . . .



Model 160-G
$250.00
As illustrated complete with electrodes



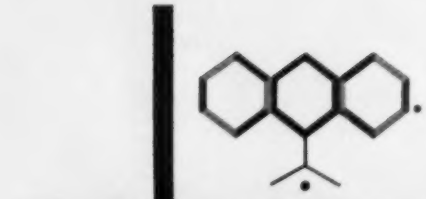
Model 302-G
$395.00
As illustrated complete with electrodes

PORTABLE UNITS

Glissando in Electro Shock Therapy is the method of applying the shock stimulus to the patient in a smooth, gradually increasing manner so that the severity of the initial onset is minimized. In the Lektra equipment this gradual increase is AUTOMATICALLY controlled for uniformity and consistency of results. The Glissando rate of rise, variable from .4 second to 2.0 seconds in steps of 0.2 second may be selected to regulate the degree of "glide" into the actual shock treatment. The Glissando is incorporated within the unit in such a manner that either Glissando Shock Therapy or Conventional Shock Therapy can be given at will.

Write Dept. A for Free Literature

LEKTRA LABORATORIES, inc.
154 ELEVENTH AVENUE NEW YORK 11, N. Y.



THORAZINE*

Shortens Duration of Psychotic Attacks

"A 50% reduction in the probable duration of a psychotic attack may be expected with ['Thorazine'] in psychotic breakdown characterized by psychomotor excitement or emotional tension."

Patients "recover with ['Thorazine'] within an unusually short time without the help of insulin coma or electroconvulsive therapy".

Furthermore, "the patient's insight is often better because amnesia and confusion do not develop under treatment".

Lehmann, H.E.: Canad. M. A. J. *72*:91 (Jan. 15) 1955.

'Thorazine' Hydrochloride is available in 10 mg., 25 mg., 50 mg. and 100 mg. tablets; 25 mg. (1 cc.) and 50 mg. (2 cc.) ampuls; and syrup (10 mg./5 cc.).

Additional information on 'Thorazine' is available on request.

Smith, Kline & French Laboratories
1530 Spring Garden Street, Philadelphia 1

*T.M. Reg. U.S. Pat. Off. for S.K.F.'s brand of chlorpromazine.

THE ACADEMIC LECTURE

The Biological Roots of Psychiatry [1]

R. W. GERARD, M.D.,[2] Ph.D., D.Sc., Chicago, Ill.

A current joke has it that neurotics build castles in the air, psychotics live in them, and psychiatrists charge them both rent. In like vein, I suppose I should add, the biologist tries to supply pilings down to earth. This is implied also by the metaphor of my title, for roots notoriously get down to and into the earth. They are less lovely, perhaps even less immediately useful, than the flowers and fruits, but they seem a fairly essential condition for the latter. The roots and fruits of psychiatry differ from one another as sharply as do those of plants, and the reasons for this will be worth our brief attention.

The biological roots penetrate from the individual, through the organ, to the cell or even the subcellular level. At such "kitchen" levels of the living the turnover of substance and energy is the dominating concern and the primary drives are for an adequate continuing supply of these for the metabolic turnover essential to dynamic, open-ended, equilibrium systems. The fruits, on the contrary, while also starting at the individual, expand to the levels of group and society. Here communication and meaning dominate, rather than matter and energy, and the secondary drives become more important—those favoring group existence and involving interpersonal relations.

Interpersonal behavior is but a small sector of the entire range of animate behavior but, like the single octave of visible light in the entire electromagnetic spectrum, it has a unique importance to social man. It therefore deserves the intense scrutiny it is now receiving, it well merits examination under the oil-immersion lens. Biology supplies an arm and fingers, a skeleton and muscles, and a reflex and "voluntary" control of movement; but it cannot yet account for the individual characteristics of each person's handwriting. Biology can pretty well characterize the violin but is only on the edge of understanding why one plays sweetly, another not. The biologist is happy to recognize that two men or two violins are more like each other than like anything else in the world; psychiatric practice takes the violin for granted and is concerned with the sour notes that come from certain ones. Biological science seems to deal with the Cheshire cat; mental science, with its smile. But psychiatry, perhaps somewhat in contrast to psychology, is firmly based on its biological and medical origins. In this epoch of rapid transition, psychiatry is indeed unhappily schizophrenic, rooted in biological science and the body, and fruiting in social science and the nuances of human interaction. Like the mother church, in the speaker's eulogy, "There she stands; one foot firmly planted on the ground, the other raised to heaven."

Meaning and information, in turn, imply a knower and a user and, thus, a purpose. It is no accident that teleological explanations come so easily in this area and that nonmaterial causes are so readily accepted. It is simple to grasp the significance of a sterile wife dreaming of babies or of a thirsting desert wanderer hallucinating oases. More, it is possible to see a purpose or function, at least in the second instance; the need of water somehow increases restlessness to seek and focusses attention and perception on the object sought. The trick is in the word "somehow." To understand the reason for or object of an act or experience is not yet to understand it adequately; a mechanism must also be revealed. Only when the action of an increased plasma osmotic pressure on the appropriate specialized neurones in the hypothalamus is laid bare, and dozens of additional mechanisms, does understanding approach the level of mastery and control. "Mechanism adds utility to truth"; we still have to discover the osmoreceptors of hal-

[1] Read at the 111th annual meeting of The American Psychiatric Association, Atlantic City, N. J., May 9-13, 1955; appears also in *Science*, August 5.

[2] Neuropsychiatric Institute, Division of Psychiatry, University of Illinois Medical School, Chicago, Ill., and Center for Advanced Study in the Behavioral Sciences, Stanford, Calif.

lucinations and the chemoreceptors of dreams!

Incidentally, the problems of stress, in its most general use, and of psychosomatic disturbances and the organ neuroses in particular, bear an inverse relation to mental disease in that they tend to root in the social sphere, with faulty interpersonal relations, and to fruit in the biological sphere, with disturbed bodily or organ function. It is also worth comment that psychiatry, as compared with neurology, for example, is dynamic and vague, as is perhaps physiology as compared with anatomy. From physiology (*Physiologoi*, which included all who sought *knowledge of nature*) were born successively; anatomy, asking "where," and concerned with the spatial relations of living things (the space or centimeter or *c* dimension); biochemistry, asking "what," and concerned with the materials of living things (the matter or gram or *g* dimension); and, in birth, biophysics, asking "when" and concerned perhaps equally specially with change and action (the time or *t* dimension). But the relatively amorphous and holistic physiology, asking "why" and "how," remains undiminished; it will yet be fertilized by many seeds from the unknown, and give birth to many daughters, as yet unenvisioned. Perhaps psychiatry is cast in a comparable role.

We all agree today that brain and mind are related; that, contrary to Alice's experience in Wonderland, the grin cannot remain after the cat is gone. But the implications of this are often overlooked. A vital force does not move a molecule and an emotion does not discharge a neurone. When experience leaves an enduring trace, it must be some sort of material imprint; and, so to speak, there can be no twisted thought without a twisted molecule. Perhaps the simplest generalization to keep in mind is that all behavior in the external world, as well as all awareness of it, depends explicitly on the discharges of neurones. Certain neurones are fired by a given sensory input, these activate others, and still others, and in time certain final neurones activate particular muscles to contract or glands to secrete. Clearly, the properties of the neural units and of their relations are crucial to all normal and disturbed behavior.

MENTAL DISEASE

In fact, the simple recognition of a dichotomy between unit and pattern at once sheds considerable light on mental disease. For a disturbance in the unit is likely to be quite a different affair from a disturbance in the pattern. Let me exemplify the point with recent illumination on muscular dystrophy. This disease has been regarded by many as due to a deficiency, comparable to the muscle pathology produced by lack of vitamin E, or to some endocrine error, or to some other unfavorable condition in the organism; and the importance of an hereditary factor has also been much debated. It proved not too difficult for workers in my laboratory to prepare tissue cultures of muscle from normal men and from dystrophy patients. Although both kinds of culture were maintained for months, in identical media, and with repeated transfers, the dystrophy muscle continued throughout to exhibit characteristic abnormalities in size, striation, nuclear position and division, etc. Such findings are direct evidence of a difference in the unit itself, whether or not additional organismic disturbances are involved. Moreover, it makes an hereditary defect highly probable, although not entirely excluding the possibility of an irreversible change in the cells, produced, after they were formed, by some abnormal experience.

Another example of close relevance would be a blindness due to damage to the visual units, as when the retinal receptors actually degenerate under sufficiently severe and maintained vitamin A lack, contrasted with damage to the normal connections in the optic system (more accurately their failure to develop), as when chimpanzees raised in total darkness cannot later in life recover usable vision. Again, the degeneration of anterior horn cells in polio constitutes a lesion at the unit level, but the comparable muscle weakness or paralysis which appears in cases of periodic family palsy, and results from a block of junctional transmission by abnormal potassium content of the blood, is equally clearly a disturbance in the connections. It is perhaps worthy of note, also, in the periodic disease that it is an hereditary defect, even though the malfunction of the neuromuscular system is a secondary one

and consequent to disturbances elsewhere in the organism.

Such considerations may help point up, if not resolve, the differing claims regarding schizophrenia. If a characteristic abnormality is regularly demonstrable in cells of schizophrenics, as for the carbohydrate metabolism of erythrocytes examined *in vitro* (reported to this Association last year by Doctors Boszormenyi-Nagy and Gerty, from the Illinois Neuropsychiatric Institute), a biochemical or metabolic lesion at the unit or cellular level is practically certain. This again implies strongly an hereditary defect, in this case well supported by the familiar genetic studies on twins and probands, but it by no means excludes additional factors, organismic or environmental, which contribute to the manifest symptoms. It is indeed possible, as has often been suggested, that there is a disturbance between cortical and hypothalamic or other primitive segmental structures; but this cannot be the "full" explanation. I have personally speculated on the possibility of a disbalance between the specific and nonspecific systems from the more ancient nerve groups that act on the cortex. The specific thalamic system is concerned with the content of consciousness, the nonspecific one with the degree of attention and of affect associated with consciousness. The dissociation of emotion from experience is perhaps the most characteristic sign of schizophrenia; moreover, it is striking that leucotomy also removes emotion from experience—as for example when eliminating the suffering associated with pain while leaving the direct pain perception unaltered.

In general, there is a sort of pyramid from etiology to symptom. Many different etiologies may initiate the same train of pathogenic events; many different pathogenic sequences may produce a single pathology; and many different pathologies may still lead to a single symptom. Thus blindness, as an example, can result from destruction of any portion of the optic system, from retina to cortex; destruction at the chiasm, say, can follow trauma, tumor, infection, etc.; an infection and abscess, as the pathogenic process, can result from infection by one of many organisms, as a direct etiologic agent, abetted by defective host resistance, and like factors. Can it be doubted that mental disease, also, presents symptoms and even syndromes which may subsume multiple nosologic entities and which are almost certainly based on multiple chains of abnormalities? Nonetheless, the present evidence seems to me to speak strongly for heavy weighting of an inherited biochemical aberration as a dominant factor in the causation of schizophrenia. Indeed, it deserves thought that the psychoses—notably schizophrenia and cyclothymia—may be primarily disturbances of the units of the nervous system, biochemical in nature and genetically carried; while the neuroses may be primarily disturbances in the patterns of function and interconnections of the neurone units, weighted on the physiological rather than the chemical, and resulting more from unfortunate relations of the individual to his environment than to his ancestors. Whether or not this sharp dichotomy is valid for all neuroses, it seems probable for the stress, anxiety and psychosomatic disturbances.

NEURAL UNITS

It is time now to turn explicitly to modern neurophysiological knowledge, concerning first the units of neural function and then their patterns. The units, the individual neurones, can vary from one to another or from time to time in: their thresholds of excitation, the related membrane potential level, the number and timing of their discharges, and the character of their metabolism. These attributes of a given cell are, in turn, normally controlled: by impulses arising from other regions; by fields surrounding them—both electrical and chemical—which result from changes in the blood supply or composition or directly from altered activity of other cellular units in their immediate neighborhood; and, as fairly basic to the electrical and physiological shifts, by their own metabolic activity. Since I have discussed most of these points elsewhere, so far as their necessary relations are concerned, I should like now only to mention a few new observations from my laboratory bearing on the metabolism of neurones. This is the more pertinent in view of the opinion expressed above, that the psychoses are predominantly associated with disturbances in neurone metabolism. Many of my colleagues

have been responsible for these researches; I shall not name most of them, but must mention at least Drs. Abood, Geiger, and Sigg. (Our thanks are also due to the ONR, the USPH Institutes of Neurology and Blindness and of Mental Health, the Army SGO, the Illinois Department of Public Welfare, the Muscular Dystrophy Association and other agencies whose support has made these studies possible.)

It has long been generally accepted that glucose is the unique and even sole substrate for the central nervous system. Although this was early shown not to hold for peripheral nerve, and although various simpler substrates, as glutamate, were shown to be metabolizable by brain slices or brei, the R.Q. of practically 1.0 and the extreme malfunction with hypoglycaemia kept glucose in the fore of our thinking. It has now proved possible, using the perfused cat brain, left in physiological connection with desired parts of the organism but supplied exclusively by known nutrients, to demonstrate the maintenance of essentially normal function for hours in the complete absence of glucose. Since the fluid entering and leaving the brain was analyzed, as well as appropriate samples from the brain itself, it can be stated positively that no carbohydrate is utilized under these conditions. Further, when the cortex is excited by stimulation of the brachial plexus there is a considerable increase in the nonprotein nitrogen of the effluent and an even larger, and fully reversible, decrease in the nitrogenous groups of the brain lipoproteins and nucleoproteins. Convulsive brain activity, induced by metrazole or electrical stimulation, is associated with a large increase of oxygen consumption but, even when adequate glucose is available in the perfusion fluid, the corresponding increase in glucose uptake occurs after the increased oxygen use is past and, moreover, it can be accounted for entirely in terms of lactic acid output. Indeed, it is even possible under appropriate conditions, such as curarization, to obtain perfectly characteristic convulsive discharges from the perfused brain with no increase in oxygen utilization.

Perhaps even more surprising, according to contemporary views, is the finding that activity is associated with a decreased formation of energy-rich phosphates; a decrease which might entirely account for the fall in creatin phosphate and ATP even if there were no increased breakdown. This decreased formation has been demonstrated with the aid of tracer phosphate—in rat brains convulsed with metrazole *in vivo*, in frog muscle subject to polarizing or stimulating currents, with or without actual contraction, and in peripheral nerve tetanized in the usual way. Since a decrease in these compounds resulting from slowed production, rather than from hastened destruction, would not be associated with increased energy output, these findings—along with several others already reported—suggest that the energy-rich phosphates may have some other function than as an energy source for action. In muscle, they are clearly related to the magnitude of the membrane potential and this, in turn, to the threshold for excitation; and similar relations almost certainly obtain for nerve fibers and neurones.

The level of ATP and CrP might thus be associated with the irritability of the brain rather than with its actual response; with communication rather than energy. In accord with such considerations, we have found that the content of energy-rich phosphates in the brain of audiogenic mice is definitely below normal during just that period of the life span, around thirty days after birth, when the animals are susceptible to sound-induced convulsions. Since the lowered organic phosphates are found in the brains of animals sensitive to convulsions—as identified by the pure breeding genetic stock—but which have not in fact been convulsed, the low level could not be a consequence of convulsive activity but must be antecedent to it.

Comparable findings have been made on the isolated mitochondria of brain, which also decrease their phosphorylation, while increasing their oxygen consumption, under the influence of exciting electrical pulses. These changes, characteristic of normal physiological responses, are in turn related to the presence of sulfhydryl groups and to a shift in potassium ion between the inside of the particulate and the surrounding medium. In fact, the failure of liver or kidney mitochondria to show this metabolic response to excitation may well be associated

with the different potassium content or ratio of these organelles. That the particulates in neurones may indeed normally participate in the excitation and recovery processes is further shown by the finding that the microsomes of cortex neurones disappear reversibly when stimulated, in the perfused brain given drug convulsions or in tissue culture subjected to electric currents.

With the incompleteness of our knowledge of neurochemistry and of the metabolic concomitants of normal activity, as exemplified by such recent findings, it is not surprising that whatever changes may be present in particular psychoses have not been previously firmly established. It also seems reasonable, with the rapid increases in interest in and knowledge of neurochemistry, to expect that major advances in this direction are imminent.

NEURAL PATTERNS

Turning now from the units to the patterns, attention also shifts focus from neurochemistry to electrophysiology. In this domain are: the properties of synaptic connections, the structure and reverberating characters of nerve nets and loops; the shape, intensity, and spread of electric and of chemical fields and the associated synchronization of electrical rhythms and discharges. Under the influence of the modern theoretical and engineering considerations that have become known under the term "cybernetics," much attention has been given to the continuous or discontinuous character of the interactions in the nervous system; and perhaps this is as useful a way as any to open the discussion of patterns.

The nerve impulse itself is atomic or discontinuous *par excellence*. It behaves in characteristic all-or-none fashion; the impulse, if it occurs at all, is the "all" or maximum of which the nerve fiber is capable at the time. This behavior, in turn, is a necessary consequence of the high factor of safety in the nerve fiber. The eddy current which flows from an active region, and constitutes the stimulus for a new region to be activated, is normally some eight times greater than the threshold of the inactive region. If the original stimulus, then, exceeds some critical intensity and fires one part of the nerve, the stimulus generated there is far more than enough to propagate excitation to other regions. Even considerable changes in the size of the action potential or in the threshold of the fiber are thus swamped out by the overpowering drive.

In contrast, most synapses show a low factor of safety; in fact a factor less than one. With few exceptions, a single impulse reaching a synapse does not suffice to fire the post-synaptic neurone; only when several impulses have managed to sum their effects, spatially or temporally, does a message carry through and the post-synaptic neurone fire. Synaptic action is thus continuous or analogical, rather than discontinuous or digital as has often been assumed; and graded effects, rather than trigger or threshold ones, operate there. The same is true for electrical or chemical fields in the brain; these are by nature continuous and graded and can shift smoothly in intensity or position. In fact, even nerve nets, with multiple neurones and myriad connections, although discontinuous in the impulses shooting about them, are in effect continuous in their operation because of the statistical averaging over large numbers of individual units.

Messages thus enter, leave, or rattle around in the nervous system as discrete signals, yet the interactions within the nervous system—which determine the patterns of activity—are mostly continuous, in actuality or in effect. It is no accident that modern information theory, concerned with factual bits of yes-no alternatives, and probability theory, concerned with continuities of expectation, both find increasing application in unravelling the tangled patterns of neural-interaction; nor is it surprising that the two-valued Aristotelian logic is yielding to its more permissive multi-valued modern derivative in rendering assistance. These considerations, moreover, are not remote from the immediate future of psychiatry. I am satisfied that the greatest barrier to rapid advance in psychiatric research today is the continuous and anecdotal character of the descriptive material on which psychiatric insights and generalizations are almost exclusively based. When more useful categories have been recognized and at least ordinal scales established; when it is possible to

group the phenomena into classes and categories in a meaningful manner, rapid progress is certain to follow. This is really the familiar problem of nosology in disease or typology in individuals or populations. But this implies just the kind of interplay between continuous and discontinuous that has been under discussion. When the input to our biological calculators has been effectively coded, the rules of operation already built into these nervous systems will suffice to grind out important answers in the mental area, as they have already in the physical and biological ones.

Electrical and chemical fields can strongly influence the interaction of neurones. This has been amply expounded in the case of the electrical fields. Changes in DC potentials have been shown to start, stop, or modify brain rhythms; and changes in the potentials have been seen to accompany changes in activity evoked in other ways, for example the diphasic DC shift accompanying cortical depression waves. The influence of potential fields and the resulting local currents in bringing about neurone synchronization is also well known, and I have suggested a hypersynchronization of beating neurones as a neural mechanism underlying causalgia, motion sickness, and neurosis. It will, therefore, be more profitable now to direct attention rather to specific chemical effects and to the influence of one molar brain region upon another, by whatever mechanism. Of especial interest in recent years have been the hypothalamic and medullary reticular formation, the interlaminar nuclei in the diencephalon, and other particular structures at the upper end of the old segmental brain stem; and the influence of these upon cerebral activity is obviously of primary concern to psychiatry.

SYMPATHIN AND CONSCIOUSNESS

Not only can stimulation of these deeper structures lead to increased or decreased electrical and functional activity of the brain and cord; we have recently found a small region, near the mammillary bodies, stimulation of which can double the oxygen consumption of the cerebrum. This increased metabolism, moreover, may outlast the period of stimulation by many minutes—a point to be considered shortly in connection with the action of epinephrine. Indeed, the specific chemical and metabolic properties of these "autonomic" centers almost ensure a rather special functional role. Thus, the reticular formation is particularly sensitive to narcotics; mescaline and like agents are reported to cause spiking in the hypothalamus; most autonomic centers are highly resistant to low oxygen and carbohydrate and to high carbon dioxide; these diencephalic structures are rich in sympathins; and, as we have recently found, both bulbocapnine and chlorpromazine inhibit phosphorylations specifically in the basal ganglia-thalamus region of the brain, while affecting that of cortex little or none. Moreover, adrenalectomy in rats leads to an increased ratio of creatine phosphate to inorganic phosphate in these basal structures only, and large epinephrine doses inhibit phosphorylation in this same region.

Many workers are now relating the level of activity of these deep structures—exactly which is far from agreed upon—to the level of normal awareness, from sleep to alertness, and associate their overactivity with disturbed mentation. The psychosomimetic action of mescaline, lysergic diethylamide, amytal, and some adrenalin derivatives has been seen as a paradigm, if not as the actual mechanism, of the pathogenesis in schizophrenia. A faulty epinephrine metabolism has been specifically suggested, and schizophrenic blood reported to contain a different adrenalin than normal, perhaps adrenoxime, and to be able to degrade injected epinephrine only abnormally slowly. Whatever the disturbances may be in psychoses, it is of some interest to reexamine the significance for normal behavior of epinephrine action on the central nervous system.

Most behavior is unconscious. Why is consciousness attached to or concomitant with certain acts and experiences? It is certainly true that awareness is most acute in association with disturbing events and is most in abeyance when the surface of existence runs smooth and placid. Extensive and splendid mechanisms have evolved to meet, adaptively and automatically, the usual situations encountered in the life of an organism; it is only when such adaptive behavior fails that innovative or creative behavior, and the

attendant consciousness, are called into action. In neurological terms, if the automatic response fails to remove the disturbing stimulus, if the simple negative feedback mechanism fails, then impulses will continue to arrive at particular neurone groups in greater numbers than normal. Some kind of summation is highly probable—the mechanisms for this, at least at synapses, are reasonably well understood—and impulses will now irradiate to additional neurone groups beyond those normally activated. Progressive radiation of activity in the nervous system, under cumulative stimulation, is a well known and fully documented phenomenon. As judged by the subjective and objective evidence of mounting affect when a disagreeable experience is continued, as well as by the physiological evidence of increased autonomic activity, one important direction of radiation is to the hypothalamus and related structures. From such activation, in turn, result an outflow of impulses up and down the neuraxis and, quite possibly, a direct liberation of sympathins. But the conditions just described are those of emergency or stress, long known to be associated with activity of the adrenals.

The adrenal medullary hormone, epinephrine, but not the closely related norepinephrine, has fairly dramatic actions on the nervous system, and a considerable outpouring of epinephrine does follow hypothalamic stimulations. This substance considerably increases the oxygen consumption of the cerebrum, assumed to be by a direct action on these neurones. In view of the evidence mentioned earlier—of the existence of hypothalamic centers, excitation of which doubles cerebral oxygen consumption, and of the excitant action of the sympathins on such centers—it should be considered if this effect also is an indirect one from the diencephalon. Epinephrine can, moreover, considerably enhance or, especially with larger doses and deeper anesthesia, depress motor responses obtained from stimulating the motor cortex or those of the knee jerk; and, in the latter case, not all the changes are abolished when diencephalic and medullary influences have been eliminated by spinal section. In general, parasympathetic activity overbalances that of the orthosympathetic system in sleep, and increased orthosympathetic activity leads to arousal; indeed, a moderate epinephrine injection can rouse an animal from moderately deep anesthesia. Perhaps the concentration level of adrenalins, or more generally sympathins, acting on the brain is a significant determinant of the level of consciousness.

We have been able to show, by infusing healthy young adults with epinephrine solutions at only two or three gamma a minute, that psychological effects are produced in the complete absence of vascular or other peripheral signs. (By contrast, much larger infusions of norepinephrine can produce vigorous cardiovascular changes, even abdominal cramps, with no change in mental state.) Minimal epinephrine doses produce a fine tremor, increased unsteadiness, and enhance word fluency; no other tests revealed differences. More striking than any change revealed by objective tests, was the subjective report of a feeling of anxiety and apprehension. Such feelings have been experienced by all subjects; and some individuals, presumably with a high pre-existing level of conflict and apprehension, approached collapse.

It is tempting to think, then, that an unresolved and therefore stressful situation leads to neural activation of primitive brain stem structures, this to the liberation of sympathin type agents, and these, by a positive feedback upon the brain, to increased attention, alertness, and anxiety. It is not an unlikely extrapolation, that still larger doses or more active derivatives could stimulate still further and produce hallucinations, disorientation, and, in general, be psychosomimetic. An oversusceptibility of neurones might be an additional factor in the true psychoses. In fact, such considerations lead us back to a reconsideration of consciousness and memory, this time in terms of circuits and neural nets rather than of electrical and chemical fields.

MEMORY AND CIRCUITS

The notion of neurones connected in a network, not merely in linear series, and of nerve impulses passing about the connections in a circular, more or less continuing, fashion, is now widely accepted. Actually, such reverberating circuits have been demon-

strated only over gross levels of the nervous system, as between cortex and thalamus (we are finding suggestive evidence of their functioning in the frog's olfactory bulb on normal olfaction), but the sort of dynamic action which is possible in such circuits or assemblies is just what the physiologist ordered to account for the less automatic and immediate aspects of behavior. So, whether finally correct or not, it will be useful to explore further some of the behavioral consequences that can flow from reverberating neurone circuits. It was early pointed out that such circuits free behavior from being time bound to the stimulus. Conduction and synaptic times no longer set the limits between stimulus and response; a neurone chain, once activated by a stimulus, might continue to reverberate indefinitely and so to serve for a maintained new behavior, for behavior appearing intermittently, or even for memory records which could play into consciousness on appropriate triggering. There are, in fact, some highly interesting relations possible between memory traces and nerve impulses running in circuits.

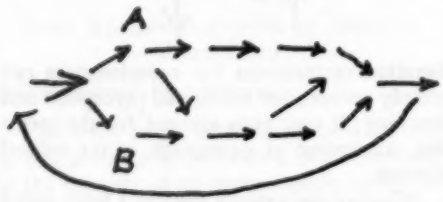
We were able to show that memory does not depend on the continuing operation of active neurone circuits or assemblies, by stopping brain activity with deep cold or by discharging all neurones simultaneously with an electric shock—either of which maneuvers should terminate any active patterns of reverberation. Hamsters, so treated after mastering a maze, showed full retention of their learning. But it was also found, by altering the interval between each learning experience and electric shock, even though a set of runs and a shock were given every twenty-four hours, that memories required a certain time to become fixed in the nervous system. Thus, when shocks followed trial runs by an interval of four hours or longer, the learning curve was as good as when no shocks were delivered; when the interval between experience and shock was reduced to an hour, some defects began to show; at fifteen minutes learning was seriously retarded; and at five minutes or less it simply did not occur. Human experience takes meaning in the light of these experiments; after a concussion, memories may be much disturbed and then return in order from earlier towards more recent times, but the events over the few minutes to an hour or so prior to the brain shock are usually lost forever. Presumably, here also the necessary time for fixation, between initial experience and the laying down of a firm mnemonic trace, was lacking.

We have further found that the temperature coefficient of this fixation process is well over two, perhaps closer to three, since hamsters kept cool during the interval between experience and electroshock show as great a disruption of learning at an interval of an hour as warm ones do at an interval of fifteen minutes. Whether or not this stout temperature coefficient indicates a chemical process in laying down the engram—an issue which is irrelevant to present considerations—it is satisfactory to find such physical regularities in the memory process; especially since the temperature coefficient is comparable to that reported decades ago for the passage of subjective time.

Our immediate concern is the possible relation of these phenomena to reverberating circuits. It may be that the single passage of an impulse over a neurone loop leaves no significant trace but that repeated passages in a limited time sum their reversible effects until some irreversible level is passed. A single water drop can leave a sand hill undisturbed but a series produces a run-off channel. If messages continue to circulate in a neurone loop, it might require their continuing reappearance at particular junctions, over minutes or hours, before the critical material change which constitutes a relatively permanent memory record can be produced. In much the same way, tetanization of a presynaptic nerve fiber for a few seconds can lead to marked and enduring enhancement of the number of post-synaptic units which it can excite. The temperature coefficient might thus be determined by the rate of reverberation, the speed of chemical fixation, or one of several other possible variables; but, whatever the details, something of this general character is strongly indicated.

A final point on memory has to do with localization. This again is not part of the main theme, but it is significant that, if memory traces are deposited at multiple loci in an activated neurone assembly, several

conflicting phenomena concerning localization seem explicable. Punctuate stimulation of the temporal cortex evokes, at least under some conditions, highly specific recall of past experiences; which indicates a sharply localized engram. Conversely, localized lesions in the brain, even fairly extensive destructions, are unlikely to abolish memories, at least beyond the major modalities encountered in the aphasias. If the neurone assembly involved in a given experience is, as the term assembly implies, not a single loop but a multiply-linked network of loops, a memory would not be entirely lost unless all parallel paths of the net were destroyed, whereas it might still be elicited quite specifically by stimulating any one appropriate locus. Thus, as shown in the diagram below, a memory would be lost only when both A and B were destroyed; it could be evoked by stimulation of either one alone. Such a



picture would, of course, predict that a given memory could be evoked on stimulation of more than one point; but, since the anatomical distribution of such loops is completely unknown and observations on man difficult, it is not a serious objection that such multiple loci have not been encountered. It is only half a decade since specific memory loci were descovered; half a century elapsed between the discovery of primary motor and sensory areas of the cortex and the discovery of secondary ones.

CONSCIOUSNESS AND CIRCUITS

If circuits enduring for minutes or hours may be required to fix experience in memory, perhaps circuits reverberating for seconds or fractions may be necessary even for the initial consciousness of an experience—or of some inner-triggered awareness. Such an hypothesis would deny that any subjective experience accompanies a single activation of any given neurone assembly (whether certain exceptions may exist is not now important) and would require the summative effect of at least a few reverberations before consciousness is aroused. This postulate leads to some interesting consequences. First, it fits the discussion above, concerning irradiation in the nervous system with unresolved problem situations. Consciousness and creative behavior are both evoked by the reverberation of circuits, while routine unattended behavior is presumably handled by messages running quickly and with no or minimal repetition through well-grooved "reflex" channels. Along the same lines, dreams might result from unresolved pressures left from the day or generated from the environment and would represent such continuing reverberation and irradiation in brain neurones.[8] If dreams represent maintained brain activity—as borborygmi accompany a maintained digestive activity—their presence with unresolved situations is physiologically reasonable. The maintained stimulation might result from lingering concerns of the day, perhaps represented in reverberating loops in the diencephalon-cortex system sensitized or activated by an accumulation of sympathins; or from a maintained barrage of interoceptive messages, as produced by a filling urinary bladder; or from a similar insistent input of exteroceptive messages, say a ringing bell—all would favor the existence of dreams.

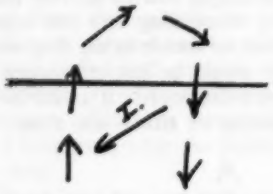
Much the same considerations would apply to hallucinations, such as those of water which are associated with thirst, to delusions,

[8] Incidentally, Freud's assumption that dreams exist to preserve sleep is not only unnecessary to his important interpretations of latent and manifest dream content and of the nature of dream work; but it also seems unsound physiologically. Physiological evidence is pretty conclusive that there is no dreaming during the deep sleep of most of the night, that dreams do occur in light sleep and during the waking-up process, but that their presence does not prevent the arousal from proceeding to awakeness. Conversely, internal or external stimuli may produce, during complete wakefulness, a wandering of attention and kaleidoscopic conscious content quite similar to that of sleep dreaming, and well called day-dreaming. The hypnogogic awareness, associated with actually falling asleep, is also comparable to the dreams during sleep, supposed to prevent wakefulness. This physiological explanation of the existence of dreams in no way detracts from the validity of psychodynamic interpretations of the dream content, latent or manifest, or of the nature of dream work—all of which are now beyond neurophysiology.

and the like. When neural activity is maintained, more and more neurone loops will be activated to that level which is associated with conscious awareness and with focussing of attention. Such a neurophysiological picture is obviously congruent with the psychodynamic one of drives or pressures which are unsatisfied, with the accumulation of something—unfortunately called energy—which finally overflows in healthy or unhealthy ways. If such biological considerations serve to account effectively for the existence of consciousness under given conditions, we need not be disappointed if the content of consciousness can be described at all now, and perhaps forever most usefully, only in terms of recent or early experience.

One final instance of a psychodynamic consequence of this postulate regarding consciousness must suffice. It has long bothered me that learned physical prohibitions remain fully conscious while those associated with enculturation are largely unconscious. Thus, a child learns by physical suffering that it must not touch hot objects, avoids touching them, and remains throughout entirely aware of the complete relationship; but the same child, punished for hitting someone, gradually develops a superego which not only forbids the act but represses the entire constellation of urge and censoring. Aside from this difference in repression—which may itself have something to do with the repetition of the experience and the gradual accumulation of the inhibition—the following aspect of repression seemed quite inexplicable. Since the superego rules are learned they are presumably associated with the cortex, and if their censoring action is to be evoked by a drive, this also should somehow involve the cortex. Yet, both the drive and the censoring remain unconscious. This is in conflict with our normal experience and expectation that activation of the appropriate cortical memory elements should be associated with conscious recall or awareness. In simple words, how can the censor censor and be censored without knowing what is happening?

Exactly the same problem arises with the recognition of words exposed tachistoscopically. Neutral four-letter words are perceived and correctly recognized after an exposure of about a hundredth of a second; "dirty" four-letter words are not recognized unless exposed for twice as long. Clearly, these words must have been correctly identified in the usual time in order to be rejected from conscious recognition; again, learned patterns in the cortex must have been activated, but not sufficiently to arouse conscious awareness. The hypothesis we are considering, that awareness results only with repeated activation of the appropriate assembly, by a brief reverberation, happily accounts for these phenomena if the first activation leads to inhibition. (In the diagram below, I blocks impulses on the way to the cortex; so one passage only occurs.) And the same reverberation requirement for consciousness can simply account for subliminal perception and learning; it may even account for the seeming occurrence of perception in 0.1 second frames.



Whether the various guesses I have dared to present to you in this talk should prove, as is highly probable, partly or entirely incorrect is not so important as is the fact that it is today possible for neurophysiologists to make such informed guesses. Not many years back such viewpoints were not only unavailable but would have been entirely unjustified by the evidence then at hand. I am particularly encouraged by the fact that this postulate concerning consciousness, and the consequences that follow as regards mental activity, were triggered by very limited discussion with a psychoanalyst. Such discussion is one of the opportunities presented at the Center for Advanced Study in Behavioral Sciences, where psychiatrists and psychologists, as well as a neurophysiologist happen to be Fellows at the same time. With growing attention to interdisciplinary behavioral science, I am very optimistic as to the progressive and increasingly valuable application of biological knowledge to mental phenomena in general and to psychiatry in particular.

EMOTIONAL AND PSYCHOLOGICAL FACTORS IN EPILEPSY: PHYSIOLOGICAL BACKGROUND[1]

W. T. LIBERSON, M.D., Ph.D., NORTHAMPTON, MASS.[2]

The problem of emotional and psychological factors in epilepsy is a dual one. First, mental manifestations may constitute an integral part of a seizure; second, it has been shown clinically and experimentally (42, 92) that emotional stimulation may precipitate seizures. The physiological analysis of this problem must deal with both its aspects. Consequently, we shall review in this paper (1) some recent advances in seizure physiology; (2) the functions of specific structures implicated in the physiology of emotions; and (3) the general and specific mechanisms by which environmental stimuli may induce seizures.

SOME RECENT ADVANCES IN SEIZURE PHYSIOLOGY

BIOCHEMISTRY OF SEIZURES

The most important recent contribution to this problem is the finding of a deficiency in the capacity of an epileptogenic cortex to bind acetylcholine (87). The importance of this finding is stressed by observations indicating that acetylcholine is a powerful convulsant. Indeed, the role of acetylcholine in the genesis of experimentally induced convulsions has been the object of investigations of several workers (19, 35).

Another important finding was disclosed by studies of hydration. These studies show that under certain conditions of electrolytic imbalance, the epileptogenic threshold is lowered (29).

ELECTROPHYSIOLOGY

An experimental seizure discharge was classically defined by Rosenblueth and Cannon (79) as a "self-sustained," "self-propagating," and, one may add, "self-terminating" afterdischarge.

Characteristics of an Elementary "Epileptic Discharge."—Clinically various patterns of seizure discharges were described: spike, spike-and-waves, sharp waves and "tonic-clonic" discharges. Especially, 3-per-sec. "spike-and-wave" discharges were opposed to "tonic-clonic" discharges, as the former are associated with petit mal seizures, while the latter are seen during a grand mal attack. However, short-lived "spike-and-wave" discharges, as well as 3-per-sec. high amplitude waves without spikes, may be seen in almost any form of epilepsy (36).

There has been much controversy regarding the significance of these various patterns. The use of both cathode-ray equipment and DC amplifiers in addition to the conventional EEG ink-writing machine has advanced to a certain degree the understanding of these different patterns. The most detailed observations have been made on the rhinencephalic structures (particularly the hippocampus) (2, 3, 15, 54-59).

Briefly, these recent observations may be summarized as follows: The stimulation of the cortex (be it iso- or allo-cortex) elicits different responses according to the "parameters" of the stimulating current. With a minimal stimulating current, only spikes and 3-5-per-sec. "spike-and-waves" are produced (Fig. 1).[3] This is particularly true when a very short duration of stimulation (below .25 sec. with 30-100-per-sec. stimulation) is applied (Fig. 2). The latter finding may be explained by a rapid "accommodation" to the processes leading to this type of response (Fig. 3). When the current and the duration of the stimulation are increased, "tonic-clonic" discharges are elicited. These responses are very complex and several components may be identified (Fig. 4). One may state in general that "tonic-clonic" dis-

[1] Read in the Symposium on Emotional and Psychological Factors in Epilepsy, at the 110th annual meeting of The American Psychiatric Association, St. Louis, Mo., May 3-7, 1954.

[2] V.A. Hospital, Northampton, Mass.

[3] This and most of the following figures are based on research carried out with several collaborators. Special acknowledgement should be given to Doctors K. Akert (Fig. 4 and 17); Dr. J. Cadilhac (Figs. 1, 2, 4, 6-11, 15-17); Doctors Scoville and Dunsmore (Figs. 13 and 14).

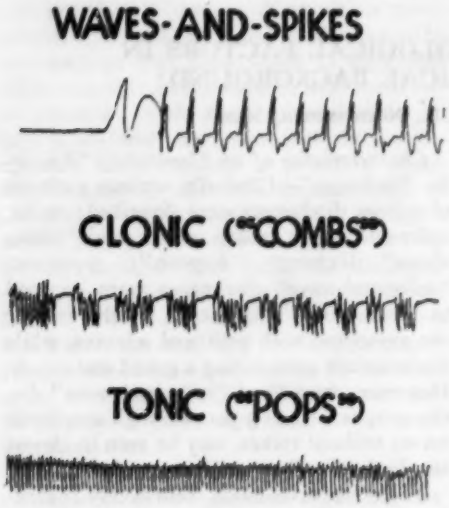


FIG. 1.—Illustrates the basic patterns of the epileptic discharges, as recorded by ink-writing oscillographs. "Wave-and-Spikes" formations are elicited with the lowest current. The first element was recorded at a higher speed than the remaining ones. Clonic Bursts are separated by periods of a steady potential. Each burst has an appearance of a "comb." Each "tooth" of the comb is called a "pop." Tonic Phase is characterized by an uninterrupted succession of "pops."

charges consist of a superimposition of frequencies of different order.

1. A slow swing of the baseline potential which may last during the entire spell (Figs. 4A and 4B). Still higher amplitude slow potential swings are usually observed after the end of the discharge. At times, a reversal of the potential is found just before the termination of the seizure discharge.

2. Superimposed slow swings of .5- to 3-per-sec. rhythm, appearing during the clonic stage (Figs. 4E and 4F). Thus, the alternation of periods of activity and of "silence" characteristic of this stage is in fact correlated with a slow oscillation of the basic potential, the basic polarization being changed in one direction during activity and reversed during each period of "silence."

3. "Pops" of 8-20 per sec. superimposed upon the swings of the basic potential during both clonic and tonic stages (Figs. 1, 4B, 4E, and 4F).

4. "Spikes" superimposed upon the "pops." Their frequency varies between 100-250-per-sec. Their duration is of 2-4ms with ordinary electrodes and is still briefer when "microelectrodes" are used (Fig. 4C and 4D). Bursts of 100-200-per-sec. spikes ("brush") are regularly seen at the onset of each element of the clonic phase (Figs. 4D and 4F), at least in the hippocampus.

5. During the postictal stage (Fig. 4A), DC swings, "prolonged fast spindles," and returning sharp waves and spikes can be seen.

At times, only one to two spikes are associated with each "pop" (Fig. 4C). This supports the contention that "spike-and-wave" phenomenon is a general finding during the epileptic discharge. The latter can be viewed as an abnormal exaggeration of the tendency for the waves of different duration to form complex patterns in which waves of longer duration either inhibit or facilitate the waves of shorter duration. Viewed from this angle, 3-per-sec. spike-and-wave complexes constitute only a particular case of this general finding.

Just like the "tonic-clonic" patterns, the 3-per-sec. discharges, whether they are(14) or are not(53) associated with spikes, are also supported by a slow wave of polariza-

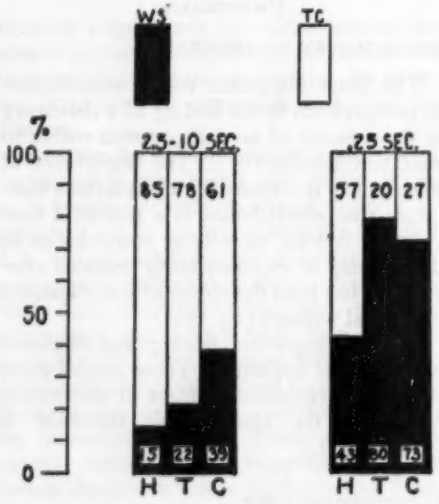


FIG. 2.—Illustrates the relative occurrence of "wave-and-spike" formations (WS) and "tonic-clonic" discharges (TC) elicited by a threshold current respectively in the hippocampus (H), the thalamus (T) and the neocortex (C). Numbers inside the rectangles indicate percentages.

Left: Total duration of stimulation—2.5 to 10 sec; Right: Total duration—.25 sec.

Note an increase in the occurrence of wave-and-spike formations when the total duration of stimulation is reduced. Note also that these formations occur less often in the hippocampus than in the other investigated structures.

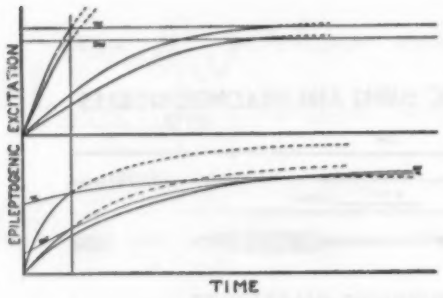


FIG. 3.—Shows how differences of accommodation to the processes leading to either spike-and-wave (SW) or "tonic-clonic" (TC) discharge could explain the findings illustrated by the preceding figure.

The upper part of the figure shows an hypothetical example in which the critical level of excitation just necessary for eliciting either TC or SW discharges (indicated by corresponding fine horizontal lines) remains the same during the growing excitatory state (no accommodation). The growing excitatory state is represented by heavier lines which become broken lines after the elicitation of the response. In such a case, there would be the same percentage of occurrence of SW and TC discharges regardless of the total duration of stimulation (the fine vertical line corresponds to a relatively short total time of stimulation). This hypothesis is, therefore, not consistent with experimental findings.

The lower part of the figure shows that the critical excitatory level necessary for the eliciting of the discharges changes during the very process of stimulation, more so for the processes leading to SW discharges than for those followed by a TC pattern (differences in accommodation). This can explain the experimental findings.

tion. When the bursts are of short duration, this slowest background wave may be seen even with the conventional clinical electroencephalographic technique (Fig. 5). When they are of longer duration, as in petit mal epilepsy, they are revealed by the use of DC amplifiers(14). The presence of these prolonged spike-and-wave discharges is possibly due to the pathological processes affecting the ability of the cortex to "accommodate" to the prolonged swings of DC potential when only minimal stimulation is applied. When cathode-ray recording technique is used, "brief spikes" may be found under certain experimental conditions to be superimposed upon the wave-and-spike discharges.

Among all of these components, the underlying swing of the baseline potential is the most intriguing one(12). It may indeed be reasonable to assume that a swing of the basic polarization (or de-polarization)(9, 11, 17, 18, 26, 30, 33, 55-58, 60, 67) may modify for a relatively long time the existing neuronal activity even in the distant areas of the brain.

Some particular frequencies in the epileptic discharge, such as 3-4, 10-20, and 100-200-per-sec. activity constantly recur in epileptogenic discharges. Why should these frequencies be, so to speak, the privileged ones?

Several workers(46, 70, 91) called attention to the existence of harmonic relationships of the frequencies of different order in brain wave activity. The explanation lies probably in the time characteristics of the excitability cycle of the cortical cells. If one seeks to produce epileptic afterdischarges using different frequencies of electrical stimuli, their total number remaining constant (the number 60 was found to be critical in one particular study), one finds that with frequencies at 15-per-sec. and above, the threshold remains relatively constant(55-58) (Fig. 6). Below the critical frequency, the threshold current rises; its increase becomes very sharp below 2-3-per-sec. This suggests an excitability cycle showing a maximum receptivity of 70-100 ms after its onset but rapidly declining after a delay of 300 ms is reached.

These data may be compared with those obtained on the basis of the study of the excitability cycle set up by a visual stimulus(7, 8). In most recent investigations on this subject, Gastaut *et al.*(25) showed that a spike elicited by a photic stimulus in a metrazolisied animal is followed by a cycle of fluctuating change of excitability. The frequency of these fluctuations is of about 10-20-per-sec., the whole cycle lasting for about ½ of a second. Thus, the frequency of 10-20-per-sec. and that of 3-per-sec. correspond to two critical values of this excitability cycle. The stimuli at 15-per-sec. frequency, and to a lesser degree some of the subharmonics, will have the greatest chance of falling during the supernormal excitability state. Below 3-per-sec., there is no more or only little summation of stimuli. On the other hand, the duration of the relative refractory states must determine the highest optimum frequency which may be present in a given neuronal aggregate. The highest rhythms of epileptic discharge found in the hippocampus (100-250-per-sec.) may be explained on this basis. These experiments give us a glimpse of a possible explanation of the existence of "privileged" frequencies of the order of 3, 15, and 200-per-sec., and of their subharmonics.

Spread and Termination of the Epileptic Discharge.—Classical investigations(1) established that the synaptic spread is made through exceedingly high frequencies of

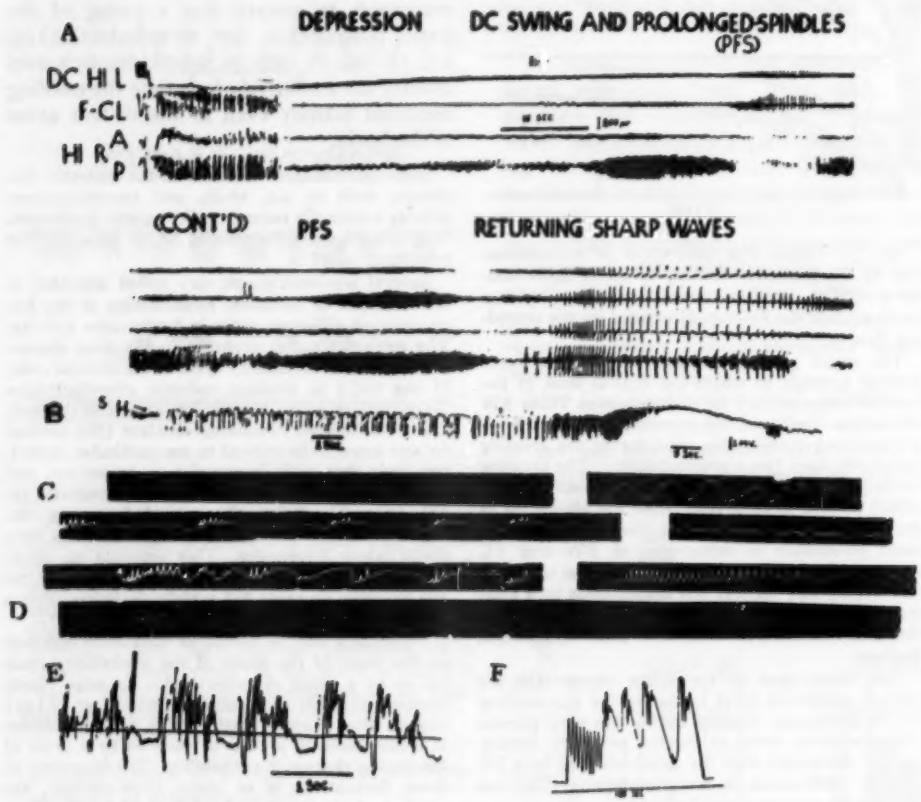


FIG. 4.—Different examples of hippocampal discharges:

A. An example of an hippocampal discharge: a short tonic-clonic discharge, followed by a depression, episodes of "prolonged fast spindles" and returning sharp waves and spikes. Note a slow swing of potential recorded with a DC amplifier, during the postictal stage. (DCHIL: Left hippocampus recorded with a DC amplifier; F-CL: fronto-central cortex; HIR: right hippocampus; A and P: respectively anterior and posterior.

B. A clonic discharge followed by a spindle associated with a DC swing. The paper speed was decreased during the second part of the tracing in order to better illustrate the DC swing. Note unidirectional discharges during the clonic state. (Hi: hippocampus; S: Stimulation)

C. and D. Examples of cathode ray recordings during the tonic stage (first 4 tracings) and at the beginning of clonic discharges (last 3 tracings). Time signal: 100 c/sec.

Note phase relationship between brief spikes and slower waves. Note also that each clonic burst starts with a shower of fast activity ("brush").

E. An example of a series of clonic bursts recorded with an inkwriter. Note pulses of slow activity with superimposed faster waves. Horizontal line: baseline; Calibration: 200μv.

F. A schematic diagram illustrating the structure of each of the clonic bursts represented on E on the basis of a combined information secured from the DC and cathode ray recordings.

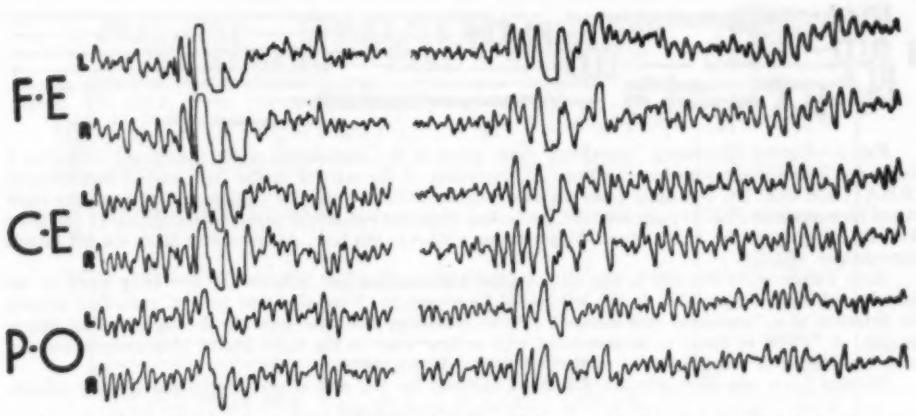


FIG. 5.—Recording of the bursts of spike-and-waves (left) and of slow waves (right) in the same patient using ordinary EEG equipment (AC recording). Note that in both cases, a slow wave underlies the paroxysmal bursts.
FE: Frontal-ear; CE: Central-ear; PO Parieto-occipital.

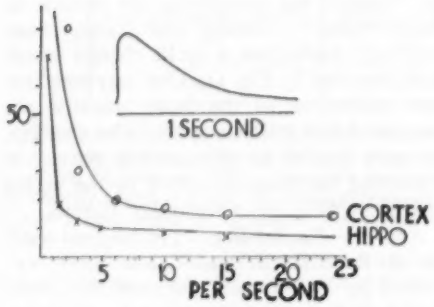


FIG. 6.—This graph shows the strength frequency curve. Vertical Scale: Threshold voltage for induced after discharge (the number of stimuli being 60). Horizontal Scale: Frequency of stimuli (1ms). Note only slight decrease of threshold above 5-per-sec. frequency, the threshold being stabilized below 15/sec. Below 3 per sec., the threshold sharply rises.
The insert shows a hypothetical course of excitatory states following each stimulus based on the strength frequency curve.

nerve impulses (up to 1000-per-sec.). However, there is an increasing number of observations favoring the presence of another mechanism of the spread of epileptogenic activity. This alternate mechanism is extrasynaptic and is expressed either by instantaneous influence of pulsating electrical fields(18, 32) or by a slowly moving wave of "DC potential"(33, 45, 55-58).

The latter are easily observed during the postictal stage. In the rhinencephalon one may record at that period slow swings of the basic potential travelling all around these structures in both hemispheres with a speed of ½ to 1 cm a minute (Fig. 7). These travelling potentials are associated or followed by a particular type of discharge that we called "prolonged fast spindles" (PFS). PFS are, therefore, also "travelling" with a slow speed of ½ cm a minute. Other postictal paroxysmal phenomena (returning sharp waves) are also found to shift from one region of the brain to another with about the same slow speed.

The spread of the epileptic discharge often takes place along the preferential anatomical pathways. However, it has been shown that one can direct the spread of the epileptic discharge into a desired channel by a selective sensitization of various neuronal aggregates(62). Could such focal sensitization result from a local, steady polarization? The following, recently reported, experiment suggests that such a sensitization may indeed be produced by a direct current. In this experiment, the polarization of different small areas of the motor cortex by a direct current resulted in muscle jerks in corresponding segments of the body, each time that the animal was subjected to auditory stimuli(80).

During the postictal stage, the changes of the basic potential represent the most striking phenomena. It is appropriate to keep in mind that during this stage marked confusion dominates the clinical picture. To what ex-

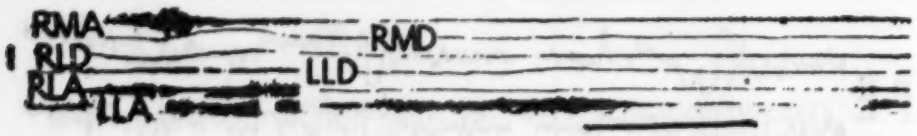


FIG. 7.—Record illustrating "travelling" slow waves in the hippocampi of the guinea pig following a single, but high voltage stimulus: 1st line: AC recording of the activity in the right medial hippocampus (RMA); 2nd line: DC recording from the same region (RMD); 3rd line: DC recording from the right lateral hippocampus (RLD); 4th line: DC recording from the left lateral hippocampus (LLD); 5th line: AC recording from the right lateral hippocampus (RLA); 6th line: AC recording from the left lateral hippocampus (LLA).

Note a slow wave starting in the right medial hippocampus and followed at first by a wave in the right lateral hippocampus, then in the left lateral hippocampus. Note also that the AC recording reveals the presence of a "prolonged fast spindle" (PFS) preceding the slow wave in the right medial hippocampus. A "PFS" is found to be associated with a slow wave in the right lateral hippocampus and the same association is found later on in the left lateral hippocampus.

Vertical Line: 200 microvolts for AC and 1 millivolt for DC recordings; Horizontal Line: 1 minute.

tent this confusion is related to slow swings of the basic potential is unknown. However, the following observation seems to be significant:

It was recently shown that the hippocampus responds to auditory stimuli with sharp "spikes"(55-58, 78). (Fig. 8). The

FIG. 8.—The evoked potentials in the temporal cortex and in the hippocampus of the guinea pig in response to the auditory stimulus (click). Monopolar recordings.

Note a longer latency time in the hippocampus than in the auditory (Temp.) cortex. The latency time in the centro-frontal cortex has an intermediate value.

amplitude of the evoked spikes changes considerably during the postictal stage of a rhinencephalic seizure discharge (Fig. 9). Often the spikes may be completely suppressed. Sometimes they show a cyclic change in amplitude. The latter observation is particularly significant during a postictal period characterized by "burst-suppression" pattern, which consists of alternation of bursts of activity and of periods of "silence." If one makes simultaneous DC and AC recordings, one may see that the 2 stages of the "burst-suppression" activity correspond to the oscillations of opposite polarity of the basic potential (Fig. 10). On the other hand, if one submits the animal to the auditory stimuli (clicks) during the postictal period characterized by the "burst-suppression" pattern, the evoked spikes will appear only during "bursts" but not during the periods of "suppression." During the burst, their amplitude undergoes a cyclic change which is represented by Fig. 11. One may conclude that oscillations of the basic potential are associated here with the excitability changes, not only insofar as spontaneous activity is concerned but also in regard to the signal activity evoked by environmental stimuli.

Epileptic Excitability.—The original studies of Rosenblueth and Cannon(79), extended by Walker and Johnson(88), have shown that a self-sustained and self-propagating afterdischarge is most easily elicited in the neighborhood of the motor cortex. Recent studies amplifying the findings of some workers in the past (28, 38, 77) have revealed another important area of high epileptogenic excitability. Periamygdaloid region in man was found to have a very low threshold for epileptic discharge(59). Gastaut(23) found low threshold in amygdala. Liberson and Akert(54); and Liberson and Cadilhac(55-58), exploring epileptogenic thresholds of the cortex, thalamus, (including medial structures) hippocampus, amygdala, and striatum, found the lowest threshold in the hippocampus. The presence of this rhinencephalic epileptogenic area is of major significance for the subject of this symposium, as the rhinencephalon is considered as one of the major structures participating in the integration of emotional processes.

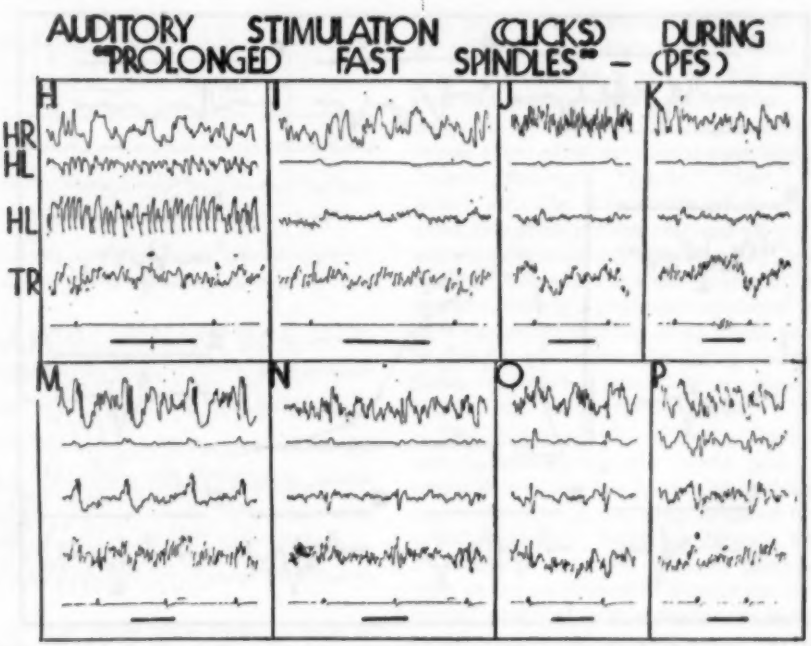


FIG. 9.—Changes of amplitude of the evoked responses in the hippocampus of the guinea pig by auditory stimuli during different phases of the postictal stage. For instance, if one follows these responses in the left hippocampus (HL), one finds no response during the presence of the spindle (Stage H) or immediately afterwards (I). Their amplitudes are very low during stages J, K, and M and progressively recover during stages N, O, and P. Analogous but less definite events occur in the right hippocampus (HR).

Note that while the evoked spikes are missing in the hippocampus (as in stage I), they are present in the neocortex (TR). This proves the local origin of the recorded spikes.

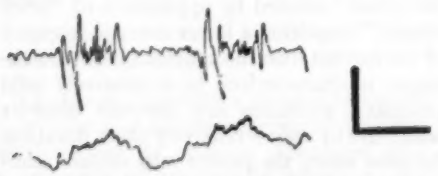


FIG. 10.—Examples of simultaneous AC (upper line) and DC (lower line) recordings of the "burst-suppression" pattern. Note deflections of opposite polarity of the basic potential associated respectively with "burst" phases and "suppression" phases.

Vertical Line: 200 microvolts (AC recording) and 1 millivolt (DC recording); Horizontal Line: 1 second.

REFLEX EPILEPSY

Under this classification one groups the examples of experimental epilepsy in which the stimulus producing a convulsion is not applied to the brain but affects it through a sensory organ—ears, eyes, skin, etc. Thus "photogenic," "audiogenic," etc. epilepsies were established as clinical entities.

It is possible(68) to sensitize a given area of the brain by various pharmacological agencies with a resulting lowering of the epileptogenic threshold. For instance, when one sensitizes the visual cortex, a flicker stimulation will induce an epileptic seizure, the auditory stimuli remaining ineffective. Likewise, only the auditory stimuli become epileptogenic after sensitization of the auditory area (Clementi epilepsy). The above described Rusinov(80) experiment suggests that sensitization may also be achieved in reflex epilepsy by focal polarization.

In cases of human audiogenic or photogenic epilepsy, the corresponding structures might be sensitized by pathological processes. Such sensitization might result from trau-

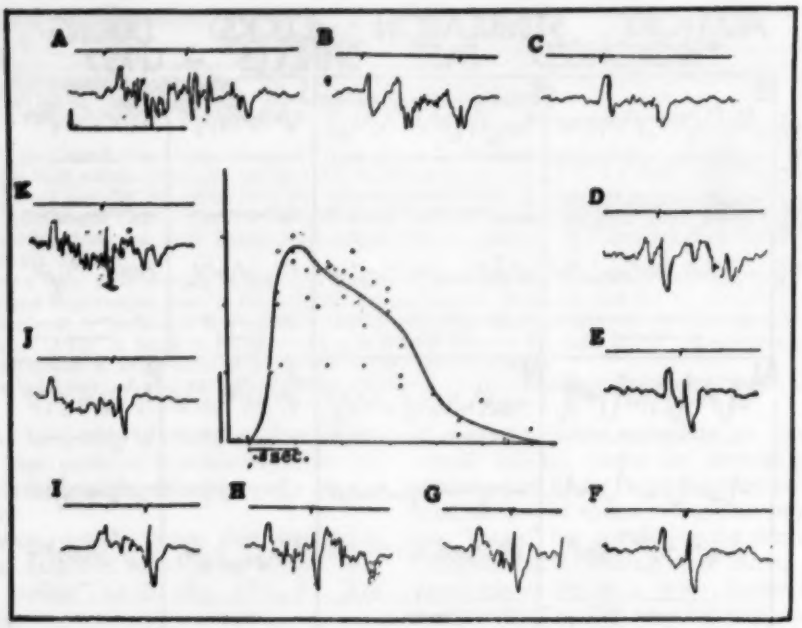


FIG. 11.—Amplitude fluctuation of the evoked hippocampal spikes (by auditory stimuli) during a "burst-suppression" pattern. The dots on the center graph indicate the amplitude found in different experiments. The origin of the coordinates correspond to the beginning of the burst. The tracings around the graph illustrate some determinations.

Horizontal Line: 1 second; Vertical Line: 100 microvolts; Signal: Clicks.

matic processes, the area surrounding the sylvian fossa being very vulnerable in head traumas. Recently (48, 51) a great number of observations were made to the effect that the development of a convulsive disorder may be preceded by a local "cerebritis," "hemispheritis," or "lobitis" usually diagnosed as "febrile convulsions." These are expressed EEG-wise during recurrent acute periods, not by typical epileptic features, but by patterns characterizing encephalitic or circulatory disturbances simulating the presence of a tumor, brain abscess, or brain edema (Fig. 12). It is conceivable that an epileptogenic sensitization results from the occurrence of such recurring acute processes.

NEUROPHYSIOLOGICAL BASIS FOR PSYCHOLOGICAL MANIFESTATION OF SEIZURES

GENERAL MECHANISMS

Studies of patients submitted to electric shock therapy administered with different types of stimulating current show that changes in mental activity depend upon the intensity of the convulsant excitation. "Electric shock" elicited by application of "brief stimuli," requiring a lower average intensity of the current than the conventional AC technique, is characterized by a relatively mild postshock confusion and memory disorder which are of only a relatively short duration. In some cases, the patient may remain semiconscious even during the convulsion (47, 50). In addition, it has been a common experience of those using brief stimulus therapy to find that fear of convulsions and associated anxiety are more pronounced in these patients than in those submitted to conventional shock.

It is conceivable that mild "spontaneous" epileptogenic processes associated with only partial decrease of awareness and therefore repeatedly threatening the ego with a danger of a partial dissolution may stir emotional restlessness according to the same mechanism

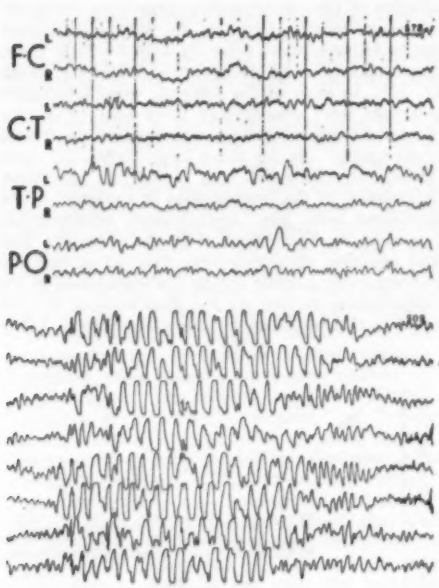


FIG. 12.—The record above shows an acute left parietal "cerebritis" during what appeared to be a benign febrile convulsion in a 3-year-old child. Three months later the second graph (below) was recorded showing a paroxysmal burst of epileptic activity.

FC: Fronto-central; CT: Centro-temporal; TP: Temporo-parietal; PO: Parieto:occipital.

as the one prevailing during brief stimulus therapy.

SPECIFIC MECHANISMS

It has been shown by a century of clinical observation and animal experimentation that manifestations of epileptic discharges may be primarily or secondarily related to the functional significance of the area of the brain predominantly involved in the seizure.

A search for a physiological basis of the emotional and psychological manifestation seen in certain seizures resulted in an outline of several areas of the brain, the stimulation of which produces such psychological and emotional changes.

Penfield and his associates(73-76) have revealed that stimulation of various epileptogenic areas of the cortex (mostly the temporal cortex) may elicit hallucinations, dreams, memories, illusions, forced thinking, etc. More recently these investigators found, in epileptics exhibiting fear or other emotional reactions as a part of their seizures, that stimulation of the mesial surface of the temporal lobe as well as stimulation of the insula often elicits emotional manifestations: "scared feelings," "fright," "fear," "sadness," etc. The stimulation of these same areas also often induces referred visceral and autonomic phenomena: peculiar taste, hunger, nausea, cardio-acceleration—many of which are seen during a profound emotional upset. It is significant that the areas which respond in this fashion to the stimulating current are those which are a part of or are closely related to the rhinencephalon.

The rhinencephalic structures have been investigated during the recent past. One major conclusion has been made: the realization that not all the components of the so-called "olfactory" brain are directly related to olfactory function. This is particularly true as far as Ammon's Formation is concerned, and is at least partially true in regard to the amygdaloid complex.

The presence of rich connections between these structures (especially Ammon's Formation) and the anterior and posterior hypothalamus suggested to different workers the hypothesis that the hippocampus proper and related rhinencephalic structures are involved in the integration of emotional processes and visceral life(63, 64, 71, 93). This hypothesis is now being tested experimentally. So far the following information is available:

Experiments with ablation.—The classical experiment of Klüver and Bucy(41), consisting of temporal lobe ablations including the amygdaloid complex and Ammon's Formation in the monkey resulted in (1) taming of the animals; (2) exaggeration of "oral behavior" (tendency to examine everything with the mouth); (3) disturbance of the avoidance of the painful stimuli ("psychic blindness"); (4) alteration of dietary habits; and (5) oversexuality. Experiments by Smith(83-85) and Ward(90, 91) suggested that some of these findings might result also from a cingular lobectomy. On the contrary, Bard and Mouncastle(8) found that in cats the ablation of the amygdaloid complex favors manifestations of rage in the animal; ablation of the Ammon's Formation resulted in an increase of "placidity" in the animals. Spiegel *et al.* (86) elicited manifestations of rage when lesions were placed in the amygdaloid complex. Schreiner *et al.*(81) found, on the contrary, a decrease of

"aggressive" behavior in cats after amgdalectomy. As one can see, the results are still controversial and need further study.

In men, mesial temporal lobectomy affecting the mesial temporal aspect and involving both the periamygdaloid cortex and the rostral hippocampus has not resulted in any striking change in the oral or sexaul behavior(82); in some cases there were considerable memory defects. There were some acute changes which will be discussed in the following sections.

Stimulation Experiments.—Stimulation experiments have been conducted with (a) electrical, (b) chemical and (c) sensory stimuli.

Electrical Stimulation.—(*Human Studies*)—A great number of recent publications have implied that anterior cingular gyrus, posterior orbital surface, and the mesial aspect of the temporal lobe contributes to the control of vascular and respiratory functions in animals and men(4, 5, 13, 16, 21, 22, 38, 39, 43, 83-85, 114). These observations were based on the results of the electrical stimulation of the corresponding structures. Liberson *et al.*(59) found in psychotic patients under local anesthesia only meager effects of the stimulation of the orbital and cingular cortices. Stimulation of the periamygdaloid cortex consistently resulted in (1) prolonged apnea, (2) alteration of awareness, and (3) initiation of epileptic seizures (with repeated stimuli). The latter also were usually preceded by myoclonic contractions of the facial muscles(40).

Similar results are seen during the process of ablation of the corresponding structures (mechanical stimulation). Changes in mental awareness can be followed more precisely with the Jung Word Association Test on the operating table(59) (Figs. 13, 14). In most of the subjects, word association processes were considerably more affected in case of mesial temporal undercutting than during frontal undercutting. During these experiments, no overt "emotional" behavior was noted at any time. Stimulation of the hippocampus in epileptics is not associated with any psychological manifestation, according to observations of Penfield(73-76). Nor was anything of significance observed in epileptic and psychotic patients during the stimulation of the hippocampus carried on by Passouant *et al.*(72) prior to the hemispherectomy and temporal lobec-

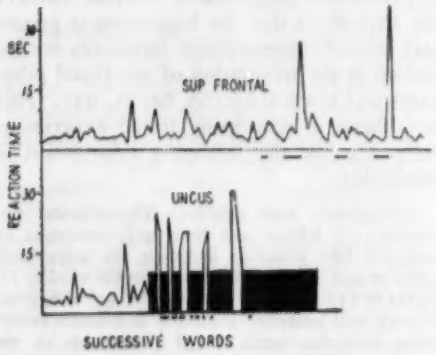
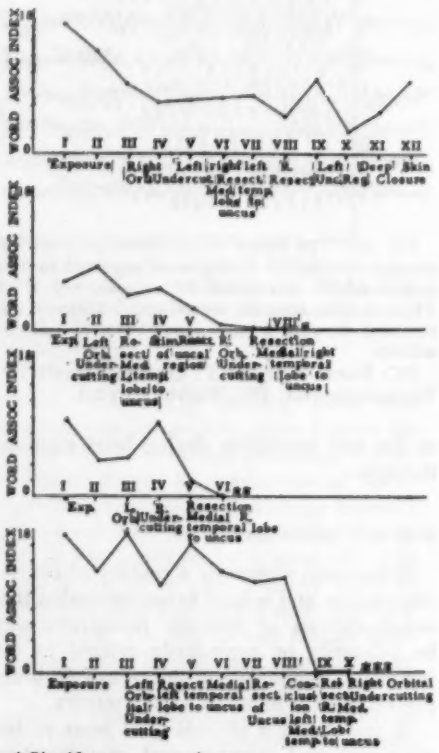


FIG. 13.—Changes in the reaction times of word association processes (Jung test) elicited by cortical stimulation respectively of the superior frontal convexity and of the periamygdaloid cortex (uncus). Dots on the horizontal axis represent successive words presented to the patient. The black rectangles represent an absence of any response. The small horizontal lines represent the duration of the stimulating current.

Note that a short period of unresponsiveness was produced by a mere mechanical contact of the electrode with the periamygdaloid cortex, before the actual stimulation began.



* Signifies unresponsiveness.

FIG. 14.—A progressive disturbance of the word-association processes during bilateral resection of the orbital surface and of the mesial aspect of the temporal lobe in 4 different patients.

Vertical scale: Word association score based on the reaction times and the "popularity" of the responses.

Note the presence of most pronounced effects when the periamygdaloid cortex (uncus) is resected on one or both sides in most instances.

tomy. These patients were under local anesthesia, but heavily sedated preoperatively.

(*Animal Studies*)—Most of the efforts were concentrated on the amygdala and the hippocampus proper.

Stimulation of the amygdala(24, 39) gives rise to different manifestations depending upon the location of the stimulating electrodes. Stimulation of the "older" nuclei produces both autonomic (pupillary dilatation, salivation, micturition, defecation, and piloerection) and somatomotor reactions (controversive reactions to the opposite side; homolateral twitching of the facial muscles and contralateral jerking movements; contralateral licking and sniffing, chewing, and respiratory inhibition). Stimulation of the "younger" division of the amygdaloid complex produces behavioral changes resembling those found by the same authors in the hippocampus. The animal assumes a facial expression of "attention," "surprise," or "bewilderment." There is some sort of searching attitude or movements directed toward the contralateral side. With an increase of the stimulating current, an attitude of fright may be observed. At times, the animal gives the impression of being hallucinated.

Stimulation of the hippocampus elicits in guinea pigs(54-58), cats, and monkeys(2, 3) changes of behavior which depend upon the intensity of stimulation, as this is a controlling factor of the degree of the spread of the afterdischarge. Even when there is a marked spread over the cortex (in guinea pigs usually the posterior half, the motor cortex being spared), the behavioral changes are dominated by inhibiting influences: decrease of evoked and of spontaneous activity. However, MacLean(65) elicited in some cats cringing and defensive attitudes, meows, and yowls and even hissing, spitting, and striking after a simultaneous noxious stimulus. These animals also showed a poor contact with the environment during stimulation.

Chemical Stimulation.—Similar reactions(65) could be observed in the acute and chronic experiments using chemical stimuli (carbachol, aluminum oxide cream). Gastaut and his associates(24) have reproduced in cats various manifestations of psychomotor epilepsy by injecting aluminum cream in a great variety of rhinencephalic, diencephalic, and mesencephalic formations. While failures were observed in cases with diencephalic and mesencephalic experimental lesions, *all the animals* in which the lesions were produced either in the pyriform cortex or amygdala or hippocampus showed manifestations of psychomotor epilepsy.

Sensory Stimulation.—Gerard, Marshall, and Saul(27) recorded in the past evoked potentials in the hippocampal formation in response to the visual stimuli. Robinson and Lennox(78) recorded in the hippocampus of cats potentials evoked by auditory stimuli characterized by "brief latency times." Liberson and Cadilhac(55-58) offered an experimental proof (experiments carried out on guinea pigs) of the presence of the evoked spikes in the hippocampus following auditory stimuli (clicks) (Fig. 8, 9, 11).

The latency time of these spikes is longer in the hippocampus than in the cortex (15ms instead of 7ms in the auditory cortex); they are much longer than in the medial geniculate body. The evoked spikes may be temporarily and selectively suppressed by a local hippocampal seizure discharge. Both of these observations indicate that the recorded spikes originate locally and not in distant structures.

It is of interest that in the hippocampus acoustically evoked spikes do not as consistently follow the auditory stimuli as is the case in the auditory cortex (Fig. 15). Often even with low frequency of stimulation a response is observed only to the first stimulus (Fig. 16). Even when the hippocampus has been responding quite regularly to such stimuli, the evoked spikes may be completely suspended after prolonged sensory stimulation.

This lability of hippocampal responses to sensory stimuli is still more manifest in regard to visual stimuli. Here, if the response is present at all, it usually occurs after the first stimulus only (Fig. 16). However, one may at times modify the experimental conditions in such a way that the hippocampus starts to respond to visual stimuli. Thus, for instance, if one alternates regular clicks and flashes and suddenly suspends the auditory stimulation, the hippocampus may start to respond to the flashes even though it was completely unresponsive to these stimuli at the beginning of the

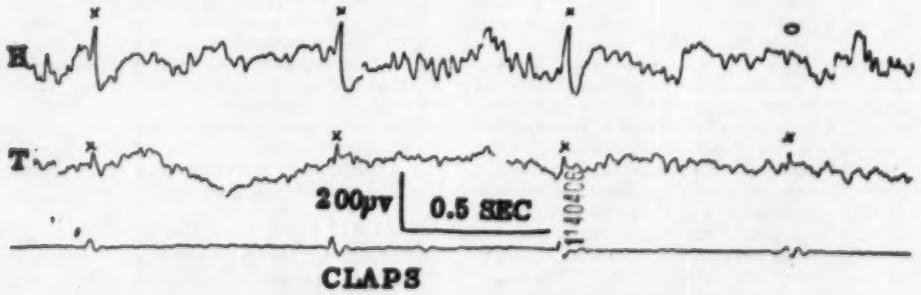


FIG. 15.—Evoked potentials in response to the auditory stimuli. Note that while the auditory neocortex responds to each stimulus (X), the hippocampus "misses" some of them (O).

H: Hippocampus; T: Temporal cortex.

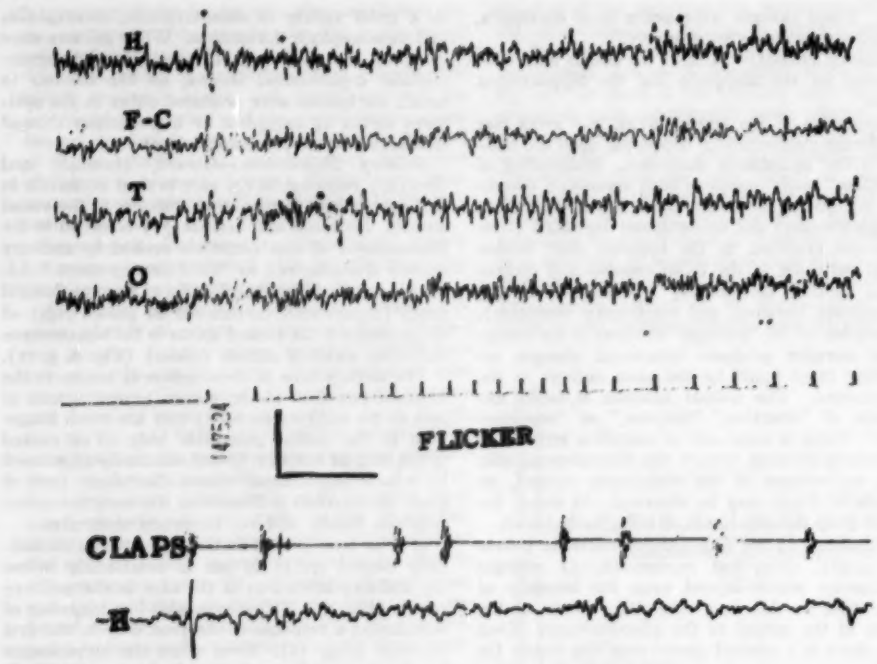


FIG. 16.—Evoked spikes in response to the visual (upper part) and auditory (lower part) stimuli. Note that in this example hippocampus responded only to the first stimulus. The paravisual neocortex (T) responded to almost every stimulus, while the association neocortex (FC) responded only to the first flash.

H: Hippocampus; FC: Fronto-central cortex; T: Temporal cortex; Calibration: 100 microvolts; Time: 1 second.

experiment (Fig. 17A and 17B). These observations suggest that hippocampal activity is affected by the elements of surprise and adaptation, and therefore, participates in the higher processes of perceptual integration.

Ammon's Formation may also respond to sensory stimuli in another way. Several years ago Jung and Kornmuller(37) reported that when a rabbit receives a hard pinch, the hippocampus responds with a hypersynchronized 6-7-per-sec. activity. This observation was recently confirmed by MacLean *et al.*(66) who found, in addition, that under conditions of noxious stimulation one may induce in various hippocampal structures a hypersynchronized fast rhythm. Liberson and Akert(54) found that hypersynchronized 6-per-sec. activity may be induced by a more discreet "emotional" stimulation; for instance, entrance of the experimenter into the animal room. This effect is particularly manifest when the animal was previously found in a state of complete relaxation (Fig. 17D). Hippocampal hypersynchronization may be associated with a depression of the neocortical activity. Green and Arduini(31) found that such hypersynchrony may be found in response to any sensory stimulus (visual and auditory) as well as following stimulation of the reticular formation. Liberson and Cadilhac(70-73) interpret these effects as an enhancement of the synchrony of the background rhythm. Thus, auditory and visual stimulation usually enhance the 4-7-per-sec. component of the background activity, while olfactori-trigeminal (and probably noxious) stimulation increases both 4-6 and 15-30 components (17C). They consider the analogies between these facts and the enhancement of temporal activity in men during mental work as well as the presence of 6-per-sec. rhythm on awakening in the immature brain of children.

The presence of a hypersynchrony in response to stimulation stresses the "totalitarian" aspect of the rhinencephalic activity brought to its culmination in an epileptic discharge.

It is well known that the diencephalic and mesencephalic structures may also participate in the integration of emotional reactions. The related facts are readily available in classical publications. Three observations should be made: Murphy and Gelhorn(69) were able

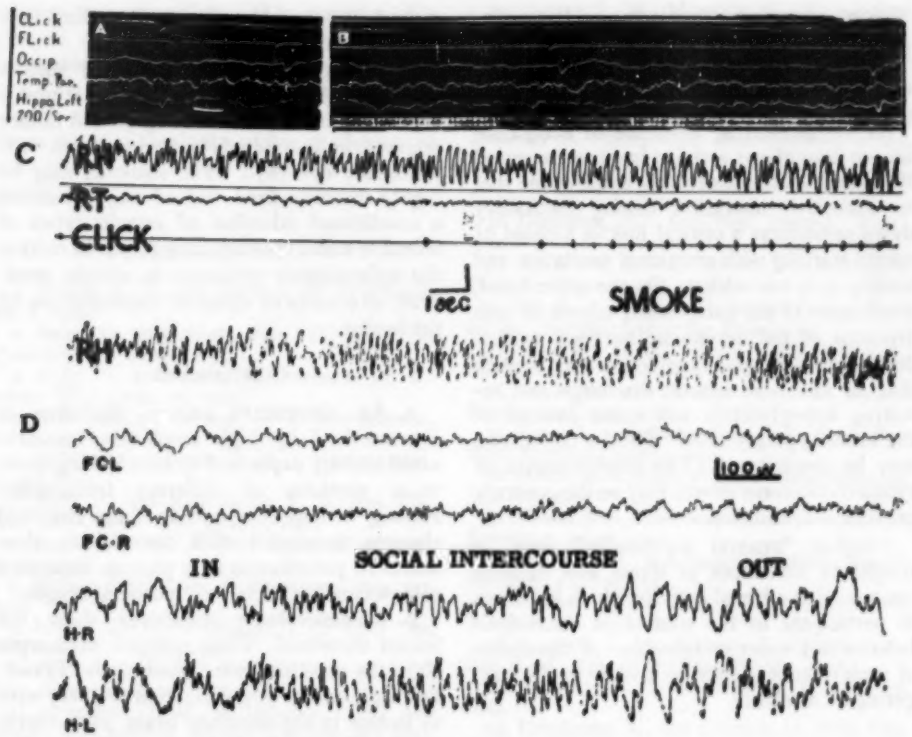


FIG. 17.—Illustrates effects that sensory stimuli have on the hippocampus:

A. Evoked potentials recorded in the hippocampus in response to an auditory stimulus (click) and in the occipital cortex in response to a flash.

During this experiment, flashes and clicks succeeded regularly each to another.

B. This illustrates the effect of a "surprise." During this part of the experiment, the clicks were suddenly suspended and only flashes were produced. Hippocampus shows then a response to a flash (extreme right). Time: .10 sec.

C. Synchronizing effect of the clicks and of smoke upon the background activity of the hippocampus. (RH: Right hippocampus; RT: Right "temporal" region). Calibration: 100 microvolts.

D. Differential effects of an emotional stimulation respectively on the corticogram (fronto-central) and hippocampus proper. At the mark "in," the experimentor came into the animal room and "talked" with a previously drowsing guinea pig. At the mark "out," he left the room. Note that while the cortex showed a depression of slow activity with a low amplitude fast rhythm, an organized, 6-per-second activity appeared in the hippocampus.

to induce seizure activity in the pharmacologically predisposed cortex by stimulation of the hypothalamus. Bonvallet, Dell, and Hiebel(13) discovered that the mesencephalic reticular formation contains a coordinating mechanism regulating the "sympathetic tone." Stimulation of the peripheral end of the splanchnic nerve or an injection of adrenalin produces an intense "activation" of all the cortical areas; on the other hand, the "sympathetic tone" may be decreased by the distention of the carotid sinus. Both these effects could be suppressed by an intercollicular lesion aiming at the destruction of the Magoun's reticular formation. Freedman and Moossy(20) found that the destruction of the reticular core on one side leads to a decrease of the electrically induced convulsive activity of the ipsilateral cortex.

Mechanisms of Emotionally Induced Seizure Activity

GENERAL MECHANISMS

As the facilitating influence of acetylcholine on convulsant activity has been asserted by several investigators, it is conceivable that its excessive liberation during excitatory states constitutes a critical link in a chain of events starting with emotional excitation and leading to a convulsion. On the other hand, the balance of the antagonistic effects of both divisions of the autonomic nervous system, during an emotional experience, may be such that an excessive insulin discharge and resulting hypoglycemia will ensue instead of the usual hyperglycemia. Thus, a convulsion may be precipitated. The predominance of sympatheticotonic effects may on the contrary prevent a convulsion.

Another "general mechanism" may be sought in influences of stress and emotion upon cortico-adrenal activity which is known to participate in the control of electrolytic balance and water metabolism. A disruption of such a balance may contribute to the triggering of a seizure.

SPECIFIC MECHANISMS

In a previous paper, mechanisms of "reflex" epilepsy were described. One may wonder whether the same type of mechanism would not be involved in an emotionally induced seizure. In such a case, one should consider the possibility that the structures of the brain, which have been shown to be particularly involved in the emotional experiences (for instance, the rhinencephalon) are sensitized by a local pathological process. If this were true, then these areas could be (according to the mechanism of "reflex" epilepsy) induced into an epileptic discharge by stimuli having an emotional significance for the individual. Just as in certain cases, photogenic or audiogenic epilepsy will result from epileptogenic processes localized to the corresponding cortical areas, one could consider the possibility of the existence of an "affectogenic epilepsy" when certain cerebral structures are involved. The disclosure of an induced hypersynchrony by sensory, emotional, and noxious stimuli which we reviewed in one of the preceding sections may be particularly significant.

It is important to mention that such a hypothesis does not require that *any* stimulus with an emotional connotation should induce seizures in individuals suffering from "affectogenic epilepsy." The stimulus may be highly individualized, indeed may constitute a conditional stimulus of certain types of affective states which is able to put in motion the epileptogenic processes in certain sensitized structures or dynamic constellations of the brains.

Conclusions

1. An elementary seizure discharge is characterized by high amplitude, synchronized activity expressed by interlocking brain wave rhythms of different frequencies. Among various components of the electrical changes associated with convulsions, slow waves of polarization may play an important role during both ictal and postictal stages.

2. Rhinencephalic structures show the lowest threshold. Their epileptic discharges show the most intricate organization. Travelling slow waves of polarization are very easy to induce in the olfactory brain, particularly in the Ammon's Formation. Contrasting with the complexity and intensity of the electrical correlates of the seizure discharges, there is a meagerness of its "clinical" expression in animals in terms of motor activity. Awareness is impaired and certain manifestations of emotional disturbances are reported. Experiments with ablation and chemical stimulation confirm the role of the rhinencephalon in emotional control. Experiments with sensory stimulation which reveal a high level of intergration also show an unusual reaction of hypersynchronization under certain conditions.

3. An epileptogenic excitation of a limited extent may produce psychological manifestations by a dual mechanism: (a) Only partial decrease of awareness may be experienced by the patient as a threat of ego dissolution and thus stir his emotional reactions. (b) The involvement of certain specific areas (for instance the rhinencephalon) may be expressed by disturbances of the emotional control.

4. Emotional stimuli may induce a con-

vulsion through either (a) a creation of a general excitatory state with an excessive formation of either acetylcholine or insulin; or (b) a preliminary conditioning of certain stimuli which set up epileptogenic states in those areas of the brain which participate in the control of emotional processes ("affectogenic" epilepsy).

BIBLIOGRAPHY

1. Adrian, E. D., and Moruzzi, G. J. Physiol., **95**: 1, 1939.
2. Andy, O., and Akert, K. EEG and Clin. Neurophysiol., **5**: 320, 1953.
3. Andy, O., and Akert, K. Abstract, 3rd Internat. EEG Cong., 48, 1953.
4. Bailey, P., and Bremer, F. J. Neurophysiol., **1**: 405, 1938.
5. Bailey, P., and Sweet, W. H. J. Neurophysiol., **3**: 276, 1940.
6. Bard, P., and Mountcastle, V. B. Res. Pub. Ass. Nerv. Ment. Dis., **27**: 362, 1948.
7. Bartley, S. H. J. Cell. Comp. Physiology, **8**: 41, 1936.
8. Bishop, G. H. Am. J. Physiology, **103**: 213, 1933.
9. Bishop, G. H., and O'Leary, J. L. EEG Clin. Neurophysiol., **2**: 301, 1950.
10. Bonvallet, M., Dell, P., and Hiebel, A. EEG Clin. Neurophysiol., **6**: 119, 1954.
11. Brookhart, Y. M., and Blachly, P. H. Abstracts, XIX Internat. Physiol. Congress, 236, 1953.
12. Burns, B. D., and Grafstein, B. Abstract, XIX Internat. Physiol. Congress, 251, 1953.
13. Chapman, W. P., Livingston, R. B., and Livingston, K. E. Arch. Neurol. Psychiat., **62**: 701, 1949.
14. Cohn, R. Arch. Neurol. and Psych., **71**: 699, 1954.
15. Creutzfeldt, O. D., and Meyer-Mickeleit, R. W. Abstract, 3rd Internat. EEG Congress, 1953.
16. Delgado, J. M. R. Res. Pub. Ass. Nerv. Ment. Dis., **27**: 433, 1948.
17. Dusser de Barenne, J. G., and McCulloch, W. S. J. Neurophysiol., **2**: 319, 1939.
18. Fessard, A. Am. N. Y. Acad. Sci., **47**: 501, 1946.
19. Forster, F. M. Arch. Neurol. Psychiat., **54**: 391, 1945.
20. Freedman, D. A., and Moossy, J. Neurol., **3**: 714, 1953.
21. Fulton, J. E., and Ingraham, F. N. J. Physiol., **67**: 27, 1929.
22. Fulton, J. F., Livingston, R. R., and Davis, C. D. Fed. Proc., **6**: 108, 1947.
23. Gastaut, H. J. Physiologie, **44**: 431, 1952.
24. Gastaut, H. Epilepsia, **2**: 59, 1952.
25. Gastaut, H., and Y., Roger, A., Corriol, J., and Naquet, R. EEG Clin. Neurophysiol., **3**: 401, 1951.
26. Gerard, R. W. Cold Spring Harbor Symposia on Quantitative Biology, **4**: 292, 1936.
27. Gerard, R. W., Marshall, W. H., and Saul, L. J. Arch. Neurol. Psychiat., **36**: 675, 1936.
28. Gibbs, F. A., and Gibbs, E. L. Arch. Neurol. Psychiat., **35**: 109, 1936.
29. Glaser, G. H. Epilepsia, **2**: 7, 1953.
30. Goldring, S., Ulett, G., O'Leary, J., and Greditzer A. EEG Clin. Neurophysiol., **2**: 297, 1950.
31. Green, J. D., and Arduini, A. Abstract, XIX Internat. Physiol. Congress, 409-410, 1953.
32. Grundfest, H. Am. Rev. Physiol., **2**: 213, 1940.
33. Harreveld, A. Van: Abstract, XIX Internat. Physiol. Congress, 437, 1953.
34. Heath, *et al.* Studies in Schizophrenia. Cambridge: Harvard University Press, 1954.
35. Himwich, H. E., Weiner, I. H., Cooms, A., and Campbell, Edith. Fed. Proc., **11**: 70, 1952.
36. Jasper H., and Kershman, J. Arch. Neurol. Psychiat., **45**: 903, 1941.
37. Jung, R., and Kornmuller, A. E. Arch. Psychiat. Nervenkr, **109**: 1, 1938.
38. Kaada, B. R. Acta. Physiol. Scandinavica, **23**, Sup. 83, 1951.
39. Kaada, B. R., Anderson, P., and Jansen, J., Jr. Neurology, **4**: 48, 1954.
40. Kaada, B. R., and Jasper, H. Arch. Neurol. Psychiat., **68**: 609, 1952.
41. Klüver, H., and Bucy, P. C. Arch. Neurol. Psychiat., **42**: 979, 1939.
42. Kopeloff, L. M., Barrera, E. E., and Kopeloff, H. H. Am. J. Psychiat., **98**: 881, 1942.
43. Kremer, W. F. J. Neurophysiol., **10**: 371, 1947.
44. Kristiansen, K., and Courtois, G. EEG Clin. Neurophysiol., **1**: 265, 1949.
45. Leão, A. A. P. J. Neurophysiol., **10**: 409, 1947.
46. Liberson, W. T. Biotypol., **6**: 98, 1938.
47. Liberson, W. T. Am. J. Psychiat., **105**: 28, 1948.
48. Liberson, W. T. EEG Clin. Neurophysiol., **2**: 359, 1950.
49. Liberson, W. T. Epilepsia, **1**: 108, 1952.
50. Liberson, W. T. Res. Pub. Ass. Nerv. Ment. Dis., **31**: 199, 1953.
51. Liberson, W. T. Epilepsia, **2**: 150, 1953.
52. Liberson, W. T. Abstract, XIX Internat. Physiol. Congress, 561, 1953.
53. Liberson, W. T. J. EEG and Clin. Neurophysiol., (In press).
54. Liberson, W. T., and Akert, K. EEG Clin. Neurophysiol., **5**: 320, 1953.
55. Liberson, W. T., and Cadilhac, J. Abstract, 3rd Internat. EEG Congress, 42, 1953.
56. Liberson, W. T., and Cadilhac, J. Confinia Neurologica, **13**: 278, 1953.
57. Liberson, W. T., and Cadilhac, J. EEG and Clin. Neurophysiol., (In press).
58. Liberson, W. T., and Cadilhac, J. Montpellier Medical, **45**: 515, 1954.
59. Liberson, W. T., Scoville, W. B., and Dunsmore, R. H. EEG Clin. Neurophysiol., **3**: 1, 1951.
60. Libet, B., and Gerard, R. W. J. Neurophysiol., **4**: 438, 1941.

61. Livingston, R. B., Chapman, W. P., Livingston, K. E., and Kraintz, L. Res. Pub. Ass. Nerv. Ment. Dis., **27**: 421, 1948.
62. Longo, V. Arch. Finial, **28**: 33, 1930.
63. MacLean, P. D. Psychosom. Med., **11**: 338, 1949.
64. MacLean, P. D. EEG Clin. Neurophys., **4**: 407, 1952.
65. MacLean, P. D. J. Neurosurg., **11**: 29, 1954.
66. MacLean, P. D., Horwitz, N. H., and Robinson, F. Yale J. Biol. Med., **25**: 159, 1952.
67. Mollica, A., Moruzzi, G., and Naquet, R. EEG and Clin. Neurophysiol., **5**: 571, 1953.
68. Moruzzi, G. L'epilepsy Experimentale. Paris: Hermann, 1950.
69. Murphy, J. P., and Gellhorn, E. J. Neurophysiol., **8**: 341, 1945.
70. Pagniez, P., Liberson, W. T., and Plichet, A. Cr. Soc. Biol., **128**: 1084, 1938.
71. Papez, J. W. Arch. Neurol. Psychiat., **38**: 725, 1937.
72. Passouant, P., Gross, C., Cadilhac, J., and Vlahovitch, B. Personal communication.
73. Penfield, W., and Erickson, T. C. Epilepsy and Cerebral Localization. Springfield: C. C. Thomas, 1941.
74. Penfield, W., and Jasper, H. Epilepsy and the Functional Anatomy of the Human Brain. Boston: Little, Brown, 1954.
75. Penfield, W., and Kristiansen, K. Epileptic Seizure Patterns, Springfield: C. C. Thomas, 1951.
76. Penfield, W., and Rasmussen, T. The Central Cortex of Man. New York: Macmillan, 1950.
77. Renshaw, B., Forbes, A., and Morrison, B. R. J. Neurophysiol., **3**: 74, 1940.
78. Robinson, F., and Lennox, M. A. Fed. Proc., **10**: 110, 1951.
79. Rosenblueth, A., and Cannon, W. B. Am. J. Physiol., **135**: 690, 1942.
80. Rusinov, V. S. Abstract, XIX Internat. Physiol. Congress, 710, 1953.
81. Schreiner, L., Kling, A., and Galambox, R. Fed. Proc., **11**: 142, 1952.
82. Scoville, W. B., Dunsmore, R. M., Liberson, W. T., Henry, C. E., and Pepe, A. Res. Pub. Ass. Nerv. Ment. Dis., **31**: 342, 1953.
83. Smith, W. K. Federation Proc., **3**: 42, 1944.
84. Smith, W. K. J. Neurophysiol., **8**: 241, 1945.
85. Smith, W. K. Fed. Proc., **9**: 118, 1950.
86. Spiegel, E. A., Miller, H. R., and Oppenheimer, M. J. J. Neurophysiol., **3**: 538, 1940.
87. Tower, D. B. Epilepsia, **1**: 88, 1952.
88. Walker, A. E., and Johnson, H. C., A. N. M. D., **27**: 460, 1948.
89. Walter, W. Grey, Hill, D., Cobb, W. A., Whitteridge, D., Greville, G. D., and Heppenstall, M. E. Electroencephalography. London, 1950.
90. Ward, A. A. Res. Pub. Ass. Nerv. Ment. Dis., **27**: 438, 1948.
91. Ward, A. A., Jr. J. Neurophysiol., **11**: 13, 1948.
92. Ward, A. A., Jr., McCulloch, W. S., and Kopeloff, L. M. J. Neurophysiol., **11**: 377, 1948.
93. Yakovlev, P. K. J. Nerv. Ment. Dis., **107**: 313, 1948.

AN EVALUATION OF CARBON DIOXIDE THERAPY[1]

ALBERT A. LaVERNE, M. D., AND MORRIS HERMAN, M. D.[2]
NEW YORK CITY

INTRODUCTION

Carbon dioxide inhalation therapy has been in use at Bellevue Psychiatric Hospital for the past 3 years. During this period, we have treated approximately 200 patients. This is a report on 133 patients whose treatments have been completed and evaluated. We have experimented with different techniques of carbon dioxide therapy and have used these techniques upon a variety of neurotic disorders. We have also applied them to a small group of psychotic disorders and a few spastic neurological conditions.

HISTORY OF DEVELOPMENT

In 1929, carbon dioxide therapy was first reported by Loevenhart *et al.*(8) with 40% carbon dioxide in oxygen mixtures used only on psychotics. In 1937, Kerr(2) first reported the use of 30% carbon dioxide in oxygen mixtures on anxiety states in neurotics. In 1948, Meduna(10) reported the use of 20%-30% CO_2 in O_2 mixtures on a larger variety of neurotics. Subsequent modifications of Meduna's method, by others (17), utilized subcoma doses or introduced pure CO_2 into the breathing bag after 15-20 breaths of the 20%-30% mixture to an undetermined and unknown concentration of carbon dioxide in order to produce a deeper coma. The techniques used by the aforementioned workers may be described as slow coma techniques. The carbon dioxide concentration is not higher than 40%, and the patient breathes the gas for 20-50 consecutive breaths, which produces gradual and prolonged physiological changes lasting from induction phase through coma, and finally, to the return of full consciousness. For example, Meduna's multiple breath technique of a 30% CO_2 in O_2 mixture requires an average of 3 minutes for 30 consecutive breaths to produce coma; the return to full consciousness requires 2 minutes, for a total of 5 minutes.

In contrast, the rapid coma techniques, which were first reported by LaVerne(4) in 1952, consist of a higher concentration of carbon dioxide, above 40%, usually 70%-80% CO_2 in O_2 mixtures. These high concentrations of CO_2 are introduced to the respiratory tract suddenly, so that rapid changes of brief duration are produced leading to subcoma levels and then to the return of full consciousness. For example, a single breath(4) of 70% CO_2 in O_2 mixture (single breath technique with breath holding)(5), is forcibly inhaled by the patient, producing unconsciousness in 8 seconds and a return to full consciousness in 22 seconds, for a total of 30 seconds. Eight breaths of a 75% CO_2-O_2 mixture (rapid coma multiple breath technique) produces a level of coma comparable to that produced by 20 breaths of Meduna's 30% CO_2-70% O_2 mixture.

METHODOLOGY

The techniques employed were exclusively the Meduna and the rapid coma techniques.

Meduna's technique(11) consists of a 30% CO_2 in O_2 mixture for 20-40 consecutive inhalations preceded by nitrous oxide anesthesia(13).

Rapid coma techniques consist of higher concentrations of CO_2 (70-80% CO_2 in O_2 mixture): (1) Single breath technique (4); (2) single breath technique with voluntary breath holding(5); (3) multiple breath rapid coma technique preceded by nitrous oxide anesthesia(5); (4) multiple breath rapid coma technique preceded by partial nitrous oxide anesthesia (sub-coma) (7).

The pathological diversity of mental disorders requires that many techniques be explored for therapy. It is known that schizophrenic and obsessive compulsive disorders require more intensive treatment in other

[1] Read at the 110th annual meeting of The American Psychiatric Association, St. Louis, Mo., May 3-7, 1955.

[2] Bellevue Psychiatric Hospital and Department of Psychiatry, New York University College of Medicine.

biological therapies. The same principle is explored by the use of techniques 3 and 4 of the rapid coma method.

The majority of the patients in the rapid coma series received multiple breath rapid coma technique preceded by N_2O anesthesia.

A maintenance therapy group (6) consisted of those neurotic and alcoholic patients who improved on the initial full course of treatment, but relapsed with a partial or complete return of clinical symptoms after cessation of treatment. These patients were treated weekly with rapid coma technique for an indefinite period.

All patients of the entire study (unselected in and outpatients) were given initial psychiatric and psychological examinations. The clinical data were evaluated from information obtained from the patient and his family. Clinical evaluations were made at intervals during the course of treatment and at termination. Psychological re-evaluations were made on some patients after termination of therapy. Treatments were administered 3 times per week, up to 100 treatments. Patients received up to 2 years follow-up.

Types of patients seen were anxiety states, conversion hysterias, phobias, psychosomatic disorders, neurotic alcoholics, neurotic homosexuals, and obsessive compulsive states. A smaller group of psychotic patients included schizophrenics, involutional and psychotic depressions. A group of 5 cerebral palsy patients, between the ages of 8 and 16, and 2 dystonia musculorum deformans patients were also treated.

RATIONALE OF CARBON DIOXIDE THERAPY

The mechanism of action of carbon dioxide therapy is unknown. Various theories have been postulated by Loevenhart(8), Meduna(12), and others. Both physiological and endocrinological mechanisms have been suggested. According to Lorente de No(9), carbon dioxide produces the following changes in the central nervous system: increase in membrane potential, increase in the threshold of stimulation, increased ability to release energy, decrease of fatigability.

According to the reverberating circuit theory of Meduna(11), carbon dioxide increases the threshold of stimulation of every nerve cell in direct proportion to the logarithm of the concentration of carbon dioxide inside and outside the cell membrane. Carbon dioxide thus removes the stimulus which has set the reverberating circuit into action, that is, the feed-back mechanism, and thus restores homeostasis.

According to Schmidt(16), carbon dioxide has a specific vasodilator effect on cerebral vessels. Of a large variety of agents which have been found capable of dilating cerebral vessels, carbon dioxide produces the maximal intracranial dilatation.

Schaefer(15) has demonstrated stimulation of the pituitary and adrenal glands in animals when exposed continuously to higher concentrations of carbon dioxide.

According to LaVerne(5), in rapid coma techniques, the high concentrations of carbon dioxide introduced suddenly to the respiratory tract and circulation precipitates an intense stress reaction, stimulating the body defenses into action. Furthermore, the physiological change is so rapid that the resistance of the body tissue to carbon dioxide is minimized.

According to Gellhorn(1), high concentrations of carbon dioxide reduce the excitability of the hypothalamic-cortical system, which may account for the reduction of emotional responsiveness in the psychoneurotic.

OBSERVATIONS AND PRECAUTIONS

The use of at least 20% to 30% oxygen in the carbon dioxide mixture of rapid coma techniques is recommended. This is an added safety factor, since the therapeutic difference between 70% to 80% and that of 95% carbon dioxide concentration is insignificant.

Physiological Sensitivity.—Respiratory sensitivity to carbon dioxide occurs in some patients and may be characterized by the development of apnea[8] after inhalation of the first carbon dioxide breath. Several other patients demonstrated this type of respiratory sensitivity. In view of this type of reaction, we suggest that this pattern of response to carbon dioxide treatment be added to the list of contraindications for treatment.

Cardiovascular Sensitivity.—The mani-

[8] This should not be confused with transition apnea which occurs at the initiation of the first carbon dioxide breath, nor with hyperventilation apnea which may occur towards the end of treatment.

festation of transient cardiac arrhythmias immediately following treatment is observed in approximately 15% of all patients with any form of carbon dioxide therapy; changes in the cardiac rate or extrasystoles are not uncommon. However, the more serious arrhythmias or heart block would constitute contraindications for carbon dioxide treatment. In the presence of the less serious arrhythmias, the therapist is cautioned to induce only light physiological levels of coma.

We are undertaking a study of cardiac function during and after carbon dioxide administration in its various techniques. In the series of patients thus far studied, there was no evidence of increase in intrinsic ventricular irritability. Evidence of transient alteration of the sino-auricular mechanism was manifested by: (a) development of relative sinus tachycardia, or sinus arrhythmia during treatment, in approximately 60% of the patients; (b) auricular premature contractions in 15% of the patients; (c) slowing of the heart rate or relative brachycardia in about half of the patients. All of these changes are benign and reversible.

An electrocardiogram should be a routine procedure as part of the medical examination prior to initiation of treatment in order to more adequately rule out cardiovascular disease.

Contraindications.—These are severe hypertension, active pulmonary tuberculosis, cardiovascular heart disease, severe emphysema, acute allergic respiratory reaction, and respiratory or cardiovascular sensitivity to carbon dioxide and/or nitrous oxide.

No irreversible toxic effects have been noted in over 50,000 carbon dioxide treatments, utilizing the various techniques, except one fatality which occurred soon after completion of treatment, and in which the direct cause of death was not ascertained, but appeared to be cardiac in nature.

Complications.—One alcoholic patient, treated with the Meduna technique, developed severe bilateral subjunctival hemorrhages at the fifteenth treatment, requiring cessation of therapy. This complication resolved without residua after 2 weeks.

In 3 neurotic patients, treated with the Meduna technique, anxiety developed into a panic state bordering on acute psychosis, and in another neurotic patient, such treatment precipitated a gross psychosis after the twentieth treatment.

Two borderline psychotic patients treated with the single breath technique of rapid coma were precipitated into gross psychoses, one after 5 treatments and the other after 20 treatments.

Transient irregularities of the pulse were found in approximately 15% of the total series and were slightly more frequent with rapid coma techniques.

Treatment anxiety is a complication which is not too infrequently associated with all techniques of carbon dioxide inhalation therapy. It may be considered to be a form of sensitization of the body to carbon dioxide which may occur at any time during a series of treatments with both conventional methods of Meduna and rapid coma techniques. It is important to differentiate this treatment anxiety from anxiety caused by the irritative effects of higher concentrations of carbon dioxide upon the mucous membranes which produces the sensation of suffocation and is frequently encountered at precoma levels.

This treatment anxiety may frighten the patient away or produce an exacerbation of the clinical symptoms with a superimposed anxiety. In any event it often results in a treatment failure. It requires considerable skill of the therapist in management. We have not been able to prevent entirely this complication, either by avoiding overtreatment, or by the use of nitrous oxide induction anesthesia as recommended by Meduna; however, we have frequently succeeded(7) in alleviating it sufficiently to enable the patient to complete treatment. As the deeper physiological levels of carbon dioxide therapy are achieved, treatment anxiety tends to become greater.

The therapist should avoid the production of deep or prolonged physiological levels of coma or convulsions since this increases treatment anxiety and may add to the physical hazard of treatment.

The diagnosis of treatment anxiety and its management are essential to the armamentarium of the carbon dioxide therapist, and, if neglected, may frequently make the "cure" worse than the disease. Undoubtedly, many

carbon dioxide failures could have been avoided had the therapist been aware of the significance of treatment anxiety. The management of treatment anxiety is directed towards its desensitization.

RESULTS

The criterion for clinical improvement used in this study was the alleviation of primary symptoms to the extent that the patient was no longer incapacitated. Those patients who did not return to complete their series of treatments were computed as treatment failures in both the Meduna and the rapid coma studies. This group comprises approximately 20% of the combined series.

Meduna Technique.—(1) Of 50 patients treated with the Meduna technique (30% CO_2-70% O_2), 28 represented types that Meduna recommends for CO_2 therapy. Six, or 22%, of these 28 patients improved clinically and maintained improvement up to 18 months.

The breakdown of these 28 treated cases is as follows: 9 anxiety neuroses (3 improved); 9 alcoholics—neurotic (1 improved); 5 conversion hysterias (2 improved); 1 stammerer (no improvement); 2 neurotic homosexuals (no improvement); 2 neurotic depressions (no improvement).

The breakdown of 22 treated cases that Meduna does not recommend for CO_2 therapy is as follows: 7 obsessive compulsive neuroses (none improved); 3 drug addicts—psychopathic type (none improved); 1 psychotic depression (no improvement); 4 schizophrenics (none improved); 5 cerebral palsies (none improved); 2 dystonia musculorum deformans (none improved).

Rapid Coma Techniques.—(70%-80% CO_2 in O_2 mixtures). Of 92 patients treated with rapid coma techniques, 50 represented types that are recommended by Meduna for CO_2 therapy. Twenty-five, or 50%, of these patients improved clinically and maintained improvement up to 18 months. Seventeen of this latter group were patients who had previously been treated unsuccessfully with the Meduna technique.

The breakdown of the 50 treated cases is as follows: 16 anxiety neuroses (11 improved); 13 alcoholics—neurotic (3 improved); 4 neurotic depressions (2 improved); 4 stammerers (2 improved); 9 conversion hysterias (5 improved); 2 drug addicts—neurotic (1 improved); 2 neurotic homosexuals (1 improved).

Of 42 patients treated with rapid coma techniques, who were types that Meduna does not recommend for CO_2 therapy, the breakdown is as follows: 15 obsessive compulsive neuroses (7 or 47% improved clinically and maintained improvement for up to 24 months); 2 psychotic depressions (1 improved for a follow-up of 4 months); 24 schizophrenics (8 or 33% improved clinically and maintained improvement up to 18 months). The best response was noted in the confused, agitated, and paranoid types, whereas, the poorest was in the catatonic type of schizophrenia; 1 cerebral palsy (no improvement).

In the maintenance therapy group (treated with rapid coma techniques) of 25 neurotic patients, 16 or 64% improved clinically up to a period of 1 year. The breakdown of these is as follows: 8 anxiety neurotics (7 improved); 1 neurotic depression (no improvement); 10 obsessive compulsive neuroses (4 improved); 5 conversion hysterias (4 improved); 1 neurotic homosexual (improved). Of 25 alcoholics (neurotic), 11 or 44% improved clinically for a period up to 18 months.

The maintenance therapy groups represented patients who improved with the initial routine course of carbon dioxide therapy, but relapsed soon after cessation of treatments. This type of patient therefore must receive the weekly administration of carbon dioxide for an indefinite period in order to remain in relative remission.

Controls.—All control patients were given 20 treatments with a mixture of 95% nitrous oxide spiked with 5% carbon dioxide for less than one minute until coma was induced.

In the neurotic group (excluding obsessive compulsive), 2, or 10%, of 20 neurotic patients improved for a 6-month follow-up. The breakdown is as follows: 5 anxiety neuroses (no improvement); 1 neurotic depression (no improvement); 5 alcoholics—neurotic (none improved); 8 conversion hysterias (2 improved); 1 neurotic homosexual (no improvement). In 5 obsessive

compulsive neuroses there was no improvement; in the 5 schizophrenics, no improvement. These included paranoid, catatonic, and mixed varieties.

REMARKS

1. A considerable number of carbon dioxide treatments is required to produce an actual clinical remission regardless of the diagnosis. Except for the occasional patient, improvement is slowly cumulative, and as long as the patient manifests clinical progress, however minimal, treatment should be continued.

2. The deeper physiological techniques of rapid coma are not recommended since they did not enhance clinical improvement and are potentially hazardous.

3. An occasional patient, who could not breath the higher concentration of rapid coma was successfully administered treatment with the Meduna concentration.

4. In schizophrenia and psychotic depressions, rapid coma should be employed only when other biological therapies have been unsuccessful.

5. Patients receiving any form of carbon dioxide therapy experienced no noticeable memory impairment during the course of treatment.

6. In general, the alcoholic patients manifested the lowest threshold of physiological reaction to carbon dioxide, and schizophrenics, the highest threshold.

7. "Subcoma" is the safest and most effective rapid coma technique and is exclusively recommended for use in preference to the other rapid coma techniques. It consists of premedication with ¾ to 1¼ grains of Nembutal orally and 1/50 to 1/75 grain atropine sulfate intramuscularly administered ½ hour prior to treatment. The patient then inhales about 20 seconds pure nitrous oxide to produce only partial induction anesthesia. Eight seconds later he is encouraged to breathe deeply 3-5 breaths of 80% carbon dioxide in oxygen mixture. At this point, the patient is still conscious and immediately thereafter experiences a profound physiological effect. Two minutes later, a similar subcoma treatment is administered to constitute a treatment session.

8. Premedication with atropine is used to minimize untoward cardiovascular or respiratory responses, and barbiturates are used to control treatment anxiety. Premedication as described is recommended for all forms of carbon dioxide therapy.

Summary

1. One hundred and thirty-three patients were treated experimentally with carbon dioxide therapy. The Meduna and rapid coma techniques were used exclusively. Twenty per cent of the patients received simultaneous psychotherapy.

2. Prior to carbon dioxide therapy, one-third of all the patients had received psychiatric treatment unsuccessfully.

3. The clinical results of rapid coma techniques were superior to those achieved by the Meduna technique; using the Meduna technique, 22% of a neurotic group improved clinically, whereas, 50% improvement in a comparable group was achieved with rapid coma techniques. Forty-seven per cent of a group of 15 obsessive compulsive neuroses improved clinically when treated with rapid coma technique. Of a group of 24 schizophrenics, 33% improved clinically with rapid coma therapy.

There appeared to be no significant influence on the over-all results whether the patient had previous or concurrent psychotherapy in relation to carbon dioxide therapy.

4. Carbon dioxide therapy with the Meduna technique was ineffective in treatment of a group of 5 cerebral palsy and 2 dystonia musculorum deformans patients. One cerebral palsy patient was treated unsuccessfully with rapid coma.

5. The diagnosis of treatment anxiety and its management is essential to the armamentarium of the carbon dioxide therapist.

Conclusion

1. We have enlarged the contraindications and prerequisites for carbon dioxide therapy.

2. Since carbon dioxide therapy is not without physical hazard if the contraindications are not observed, we recommend that such therapy be administered only by a physician.

3. The various techniques of carbon dioxide therapy are relatively safe procedures

however, providing the contraindications are observed.

4. It is recommended that carbon dioxide therapy be administered only by physicians with adequate experience in psychiatric discipline, since such therapy is not without psychiatric hazard if precautions for selection of patients and administration of therapy are not observed.

5. Rapid coma technique is not recommended as a substitute for the biological therapies in the treatment of schizophrenia and psychotic depressions. The use of rapid coma in this group of disorders is still experimental and inconclusive.

6. The clinical results achieved with rapid coma in the obsessive-compulsive and other neurotic disorders warrant further investigation.

7. Carbon dioxide therapy is worthy of further study in the exploration of new techniques and their application to psychiatric disorders.

BIBLIOGRAPHY

1. Gellhorn, Ernst. J. Ment. Sc., 99: 416, July 1953.
2. Kerr, J. J., Dalton, J. W., and Gliebe, P. A. Ann. Int. Med., 11: 961, Dec. 1937.
3. LaVerne, A. A., and Herman, Morris. Dis. Nerv. Syst., 14: 209, 1953.
4. LaVerne, A. A. Dis. Nerv. Syst., 14: 141, 1953.
5. LaVerne, A. A. Dis. Nerv. Syst., 14: 269, 1953.
6. LaVerne, A. A., and Herman, Morris. Dis. Nerv. Syst., 14: 10, Oct. 1953.
7. LaVerne, A. A. Ancillary Methods in Carbon Dioxide Therapy (In Press).
8. Loevenhart, A. S., Lorenz, W. P., and Waters, R. M. J.A.M.A., 92: 880, 1929.
9. Lorente de No, R. *in* Fulton, J. F., Physiology of the Nervous System, 3d ed. New York: Oxford University Press, pp. 288-315, 1949.
10. Meduna, L. J. J. Nerv. Dis., 108: 5, 1948.
11. Meduna, L. J. Carbon Dioxide Therapy. Springfield: C. C. Thomas, 1950.
12. Meduna, L. J. J. Nerv. Ment. Dis., 110: 438, 1949.
13. Meduna, L. J. Dis. Nerv. Syst., 14: 4, 1953.
14. Meduna, L. J. Dis. Nerv. Syst., 8: 2, 1947.
15. Schaeffer, K. E. Am. J. Physiol., 163: 747, 1950.
16. Schmidt, C. F. Cerebral Circulation in Health and Diseases. Springfield: C. C. Thomas, 1950.
17. Wilcox, P. W. Dis. Nerv. Syst., 12: 35, 1951.

DISCUSSION

NORMAN R. ROGERS, M.D. (Palo Alto, Calif.) —Dr. LaVerne's paper represents primarily an attempt to compare the Meduna technique with his own rapid coma technique. There is a remarkable discrepancy in the results between the 2 techniques. In the group of 50 patients treated with the Meduna technique only 22% improved and remained so for 18 months, while 50% improved with the LaVerne technique and maintained their improvement for the same length of time. And, incidentally, of those 25 patients in the latter group 17 had previously been treated unsuccessfully with the Meduna technique. No attempt has been made to explain this wide gap between the results of the 2 techniques. This is especially puzzling since Dr. LaVerne does not postulate any major difference between the technique as to the physiological effects of the gas on the central nervous system.

Another discrepancy is apparent in the low improvement ratio that Dr. LaVerne obtained with Dr. Meduna's technique (22%), compared with the ratio Dr. Meduna himself was able to obtain (better than 60%). I wonder whether these glaring discrepancies are not due to differences in the psychotherapeutic management in the 2 clinics rather than in the efficacy of the technique and differences in their physiological action.

The 142 treated patients reported on were matched by a control group of only 20 patients. The latter were given 20 treatments compared with up to 100 treatments of the carbon dioxide patients. They were followed for 6 months only instead of the 18 months' follow-up in the carbon dioxide group. Furthermore the nitrous oxide was "spiked" with 5% carbon dioxide. The central nervous system is reported to be highly selective in its takeup of carbon dioxide and it is possible that actually a much higher concentration of carbon dioxide in the blood was achieved than the 5% in the mixture may suggest. For these reasons the validity of the control group is highly questionable. Dr. LaVerne reports on 6 patients with cerebral palsy and one with dystoma musculorum deformans treated with carbon dioxide; all unimproved. It would be interesting to find out the rationale for attempting to treat such cases with carbon dioxide.

In the summary it is mentioned that 20% of the patients received psychotherapy. It would be important to know how these patients were distributed even though Dr. LaVerne felt that previous or concurrent psychotherapy was of no significant influence in the over-all results. As a matter of fact this has become a point of major disagreement. Many of us feel that it is impossible to disregard the psychological impact of carbon dioxide, or any other form of inhalation therapy for that matter. A patient asked to come to a psychiatrist's office or clinic 3 times a week, and questioned even briefly about his well-being has already interacted with the therapist, developed transference, and therefore received psychotherapy. If, in addition, that patient is being placed on a bed and has a mask put on his face and is rendered unconscious, the psychotherapeutic impact is considerable. This is magnified to a great extent if the patient is questioned, as is customary, as to his experiences while under treatment. This also may explain the findings in the

maintenance group. Those patients improved while in therapy, relapsed when carbon dioxide treatments were discontinued, but when treatment was resumed, improved again and were able to maintain this improvement as long as they were receiving weekly carbon dioxide treatments, that is as long as they were seen weekly, were able to interact and permitted to get supportive psychotherapy.

For these reasons I feel that it would be more realistic to attempt to explore the psychological implications of carbon dioxide therapy rather than to concentrate on the neurophysiological effects of the gas, which are numerous and often actually antagonistic and conflicting. We must not select just those physiological effects that fit our hypothesis and disregard those that invalidate it.

I do agree with Dr. LaVerne that high concentrations of carbon dioxide introduced into the respiratory tract and circulation precipitate an intense stress reaction and mobilize the patient's defenses; but I believe that this occurs with any technique, and that carbon dioxide stimulates not only the defenses of the body, but also, and primarily, the defenses of the psyche.

PHYSIOLOGICAL CONCOMITANTS OF THE PHASIC DISTURBANCES SEEN IN PERIODIC CATATONIA[1]

A. BONKALO, M.D., J. W. LOVETT DOUST, M.B., AND A. B. STOKES, M.B.
TORONTO, CANADA[2]

Since 1949 there has been in continuous existence a kinetic longitudinal study of patients with periodic catatonia at the metabolic unit of the Toronto Psychiatric Hospital. At varying times this investigation has concentrated on different clinical, biochemical, endocrinological, and physiological aspects of the disease: always it has been orientated towards the ideal of a longitudinal type of survey in which interacting variables have been observed from day to day over extensive periods and the metabolic patterns they have assumed correlated sequentially with the changing psychiatric pictures. Results tend to accrue slowly from this methodology, yet they can be obtained in no other way, and the natural history of this form of schizophrenia lends itself most appropriately to such a plan of attack.

In the past, most reports dealing with periodic catatonia have dealt primarily with biochemical studies (1, 4, 5, 6, 7, 8, 24); the present communication attempts a correlation of the phasic disturbance with some physiological variables, and notably in the twin spheres of electrocortical activity and oxygen metabolism.

CLINICAL MATERIAL

Three patients were studied over a 2-year period. The precise details of the nursing care of patients have already been given (9). Briefly, they include careful clinical screening of the patients; the ordered regimen of their lives, sometimes for years, in the single-bed wards of the metabolic unit; their observation 48 times over each 24 hours; their constant balanced fluid diet, regularly checked for its nitrogen content by twice-weekly Kjeldahl analysis.

Of the 3 patients, 2 were males and one a female; one was a periodic excitement, the others periodic stupors; all belonged to Gjessing's "synchronous syntonic" type of periodic catatonia (5). All had been in hospital for at least an initial habituation period of 6 months before the recorded physiological assessments were begun. In all 3 patients concurrent assessments were made of mental and behavioral ("psychomotor") states by a combination of individual rating scales, the Malamud and Sands (1947) psychiatric rating scale, and nurses observations; twice-daily rectal temperatures, pulse rates, and blood pressures; daily basal metabolic rate; daily body weight and amount of sleep in 24-hour period; 2- or 3-times-weekly estimations of the serum protein-bound iodine and plasma nonprotein nitrogen; daily analysis of the total cumulative urine output for volume, specific gravity, titratable acidity, chlorides, uric acid, creatinine, creatine, amino acid and total nitrogen, 17-ketosteroids and adrenal gluco-corticoids; 3-times-weekly measurement of plasma specific gravity, plasma proteins, haemoglobin and haematocrit; where indicated extensive determinations on urinary electrolytes have been carried out. All results in each patient were individually recorded for checking purposes and master-charted on giant graphs the abscissae of which were the days of the investigation and the ordinates were severally the many procedures simultaneously involved. In this way it was possible both to observe the matrix of metabolic happenings on any given occasion and also to discern the patterns of such happenings against the time scale of their occurrence.

PHYSIOLOGICAL PROCEDURE

Two principal investigations were carried out: an analysis of the electrical activity of the brain, as recorded by the EEG, and an oximetric study of the arterialized capillary blood-oxygen saturation under resting conditions and under standardized stress conditions.

EEG.—Recordings on each patient were

[1] Read at the 110th annual meeting of The American Psychiatric Association, St. Louis, Mo., May 3-7, 1954.

[2] From the Department of Psychiatry, University of Toronto.

made routinely twice weekly, using an 8-channel Grass III Electroencephalograph. Occasionally additional recordings were made to follow critical periods by investigations daily or every second day. Standard scalp electrode placements were used in bipolar and monopolar combinations. For the latter method the ungrounded homolateral ear lobe electrode served as a reference point. The recordings were analysed by visual inspection. Counts and estimates on the alpha activity were obtained from monopolar recordings of the left occipital area in cases 1 and 3, and of the right in case 2. Alpha rate was obtained by counting the number of waves in 10 random 1-second intervals, and averaging the results. Alpha incidence (the number of alpha waves, alpha index or percent-time alpha) was calculated according to the method of Davis and Davis(2) and Davis(3) and expressed as percentage of elapsed time during which alpha waves were present in a representative 30-second sample of recording. Alpha amplitude was determined by measuring the highest general level of amplitude that appeared in regular sequences.

OXIMETRY

Daily observations to determine the arterialized capillary blood-oxygen saturations were carried out on each patient by a technique of discontinuous spectroscopic oximetry(13,14). The site of examination was the histaminized skin of the fingernail fold and a series of measurements was always taken until agreement between them was obtained. Following the resting readings the patient was instructed to hold his breath for a standardized fraction of his total breath-holding time(23), and a further reading was taken as the result of this apnoeic stress procedure. With patient repetition during preliminary work on these subjects it was possible to train them so that their co-operation could be obtained even during their periods of phasic disturbance. The percentage of the difference of the resting and stress readings, divided by the resting reading, gave the "responsivity score," a measure of the stress response. Precise details of the procedure in this method of oximetry and of the results obtained in many varieties of psychiatric illness have been extensively reported elsewhere(14-19).

RESULTS

Case 1.—Mrs. E. Y., aet. 36, is an example of the periodic catatonia syndrome with disturbed semistuporous exacerbations appearing characteristically in 3-month cycles enduring for about 10 days and separated by remission periods of relative well-being.

The EEG findings are fairly definite. Figure 1 shows some cuts from the serial recordings. Figure 2 is a sample chart which includes a stupor period. During the remission phases the alpha rate, incidence, and amplitude show little fluctuation but a moderate amount of low voltage slow activity can be noted in the 4-6 c.p.s. range, mostly bi-synchronous from fronto-temporal leads. During the 2-3 weeks preceding a descent into stupor this pattern begins to change: the alpha frequency becomes increasingly variable and showed a gradual slowing of .5 to 1 c.p.s.; simultaneously the 4-6 c.p.s. theta activity shows an increase both in incidence and amplitude. With the onset of actual stupor, the alpha rate rises sharply by 1-2 c.p.s. with a concomitant fall of 30%-50% in the actual amount of alpha activity and a reduced amplitude of some 40-60 microvolts; and along with these changes an increase in fast frequencies in the 18-24 c.p.s. beta range occurs. Slow activity in the theta range remains conspicuous and sometimes increased. Fol-

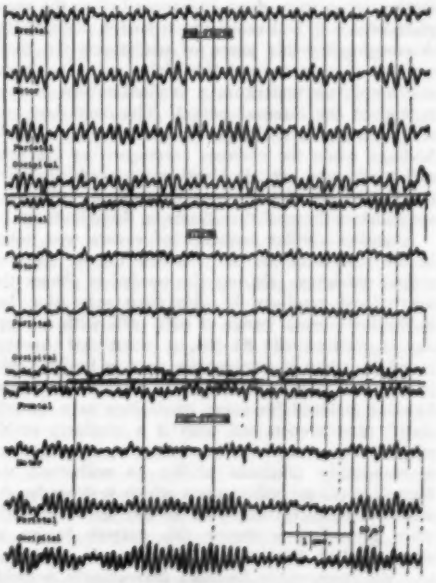


FIG. 1.—Case 1.—Typical samples of the EEG tracing at various phases of the cyclic disturbance. Unipolar recordings from the left side.

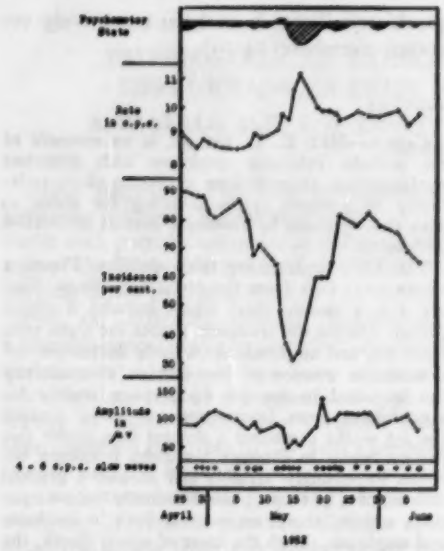


FIG. 2.—Case 1.—A 42-day record of variations in alpha rate, incidence, and amplitude giving detail of the changes during stupor. The bottom line indicates amount of slow activity: + = considerable amount; o = moderate or no slow activity during the recording period.

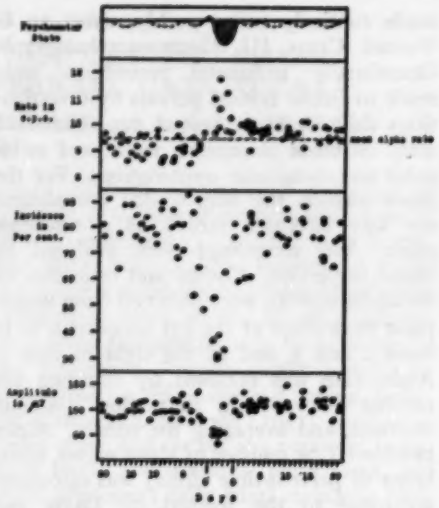


FIG. 3.—Case 1.—Analysis of the alpha rate, incidence, and amplitude. The values of 5 stupor phases are separately superimposed so that the range of variation at and close to these significant periods may be assessed.

lowing the cessation of the true stupor, a period lasting some 10-20 days intervenes before the complete return to full remission from the disturbance. Accompanying this phase of semistupor the theta activity disappears and the alpha rate, incidence, and amplitude undergoes a gradual return to that typical of the interval period. The onset and end of the stupor are sharply delineated by the EEG findings while the changes accompanying the pre- and poststupor periods blend more gradually with the EEG data of the long-term interval. Figure 3 summarizes the pooled evidence on these findings.

A rather similar sequence of events was noted in the results of the daily monitoring by spectroscopic oximetry. During the remission phases the arterialized capillary blood-oxygen saturation lay in the low-normal range of 92%-96% with day-by-day variations of 2%-3%, a somewhat greater instability than is customarily seen in healthy subjects. Characteristically, this resting remission baseline endured for some 10-20 days as a "steady state" phenomenon and with it a similarly stable responsivity score of around 0 to + 10 suggested a reasonably adequate ability to withstand the formal stress procedure upon which it depends. As with the EEG variables, in the 2-3 weeks immediately preceding a stupor this pattern begins to change. Both the resting blood-oxygen saturation and the stress-score becomes increasingly unstable and commence to fall in staircase fashion, the former more slowly and obviously than the latter. Saturation values of 88% oxygen are reached before the height of the stupor with a fall to 86% oxygen at its trough. Responsivity scores followed a similar pattern but with a slightly different timing; the plunge to low values of — 70 or less is a precipitous one and its occurrence tends immediately to precede the descent into clinical stupor. In the semistuporous phase of post-true stupor, recovery to remission values tends to be much slower in the case of the resting saturation levels than of the responsivity score.

Figure 4 indicates a close concordance between these physiological changes and the accompanying clinical state. In addition to the obvious major concomitants of the stupor condition proper, the events preceding and succeeding these episodes are faithfully mirrored physiologically. With the cessation of the 18 days or so of steady state centrally placed in the phase of remission, an increasing number of irregularities appear in the record: simultaneously the capillary blood-oxygen saturation and the alpha frequency become unstable and commence to fall progressively while slow theta frequencies begin to appear. Along with these changes clinical minor upsets begin to disturb the former relative serenity of the patient's mental state. A transient irritability, a passing phase of gastric upset with some bilious anorexia or nausea, a period of querulous and demanding aggressiveness—such indispositions would not be serious and might easily be missed without the daily clinical rating scale and observational record. Occurring early in the remission phase, they would probably be isolated events; when the remission phase is far advanced, they tend to be summative and presage a coming fall into semistupor.

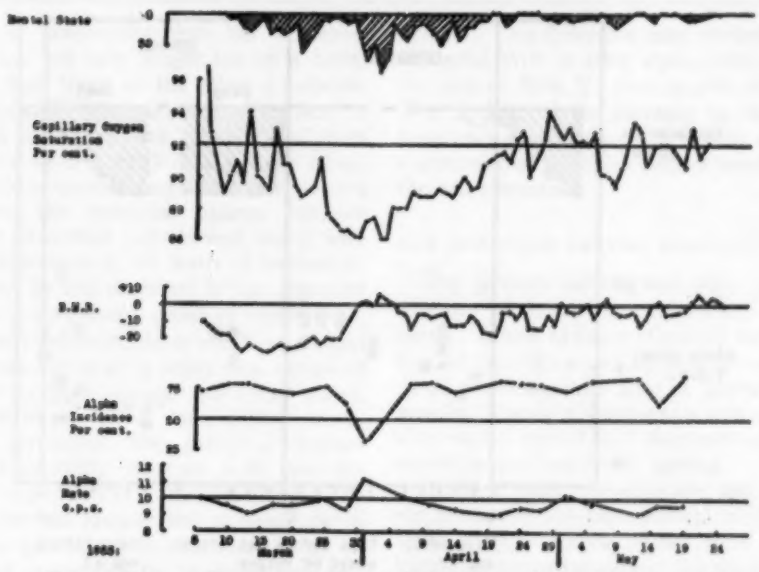


FIG. 4.—Case 1.—Summary of physiological findings of a typical stupor phase. Note the concomitance of the metabolic happenings with the mental state changes. The paradoxical increase of the oxygen consumption as the blood-oxygen saturation falls may be interpreted as an insufficient homeostatic attempt to overcome the anoxaemia and thus prevent the stupor. The "mental state" is represented in this figure and in Fig. 6 by assessment with the Malamud and Sands rating scale.

Case 2.—Mr. R. H., aet. 25, is an example of synchronous syntonic periodic catatonic stupor. The rhythm of disturbance tends to present with a precipitous onset, to endure for 10-day periods, and to be characterized by a semistuporous condition lasting 6-10 days before a 4-8 day remission interrupts another descent into deep stupor.

The EEG findings are less well differentiated than in Case 1. The record is uniformly a low-voltage one and, for the most part, poorly organized; the alpha incidence is low. On the other hand, the alpha frequency changes seem to possess a definite consistency and can be followed with satisfactory reliability. Unlike Mrs. E. Y., the alpha rate turns downward at the onset of stupor, reaching its lowest values during the most profoundly stuporous period. As the level of the patient's awareness gradually rises in the following semistuporous phase the alpha frequency increases again, often somewhat steeply, and appears to reflect rather closely the constant consciousness variation in this unstable period of homeostatic adjustment (Fig. 5).

Oximetrically, a much closer concordance with the findings in Case 1 is observed, when allowance is made for the altered time relationships involved. Deep stupor is accompanied by arterialized capillary blood-oxygen saturation falls to from 86%-87% and negative responsivity scores to from — 40 to — 70 following apnoeic stress. This anoxaemia reverses relatively quickly and levels of from 91%-93% saturation then characterize the semistuporous period in which consciousness is a precarious and fluctuating condition. In the short few hours of adequate awareness in the remission phase the oxygen saturation might peak at 93%-96%, and the responsivity scores vary between + 10 and + 50. Some examples of these findings are given in Fig. 6.

Case 3.—Mr. W. L., aet. 38, is a borderline synchronous syntonic case of periodic catatonia in whom variable sequences of catatonic excitement represent the type of psychomotor disturbance.

This patient was the least physiologically studied of the group principally because of his lack of co-operation during phases of exacerbation. Regular observations have however been continuously carried out for a period of rather more than 4 months, including one phase of minor catatonic excitement. Throughout the period of observation the manifestations of this patient's disturbance were controlled in part by administration of oral thyroid extract begun some 27 months prior to his reception into the investigation. The EEG record reveals that, simultaneously with this period of psychomotor disturbance, the alpha rate increases while the alpha incidence and its amplitude fall. The subsequent restitution of the EEG data coincides with the return of the psychomotor state to normal. Again the oximetric findings run parallel with those of the EEG and mirror the changes in the levels of awareness. Resting blood oxygen saturation levels

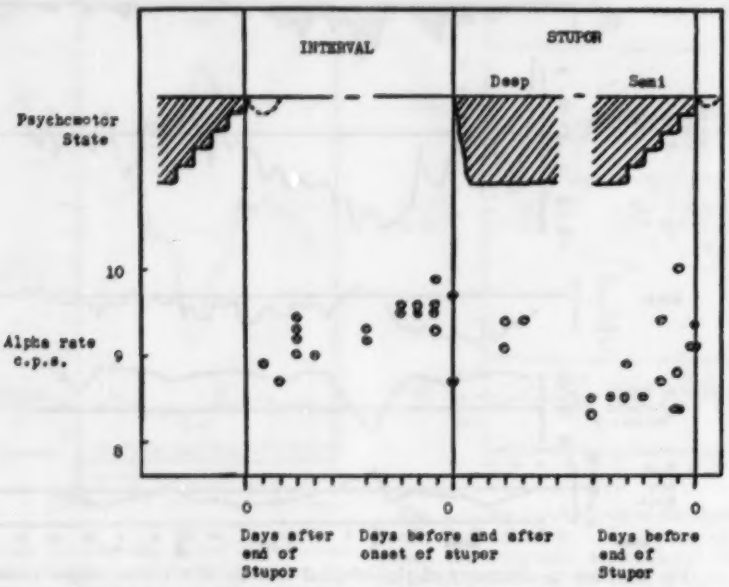


FIG. 5.—Case 2.—Analysis of the alpha rate. Superimposed values for 10 stupor and interval phases arranged as in Fig. 3.

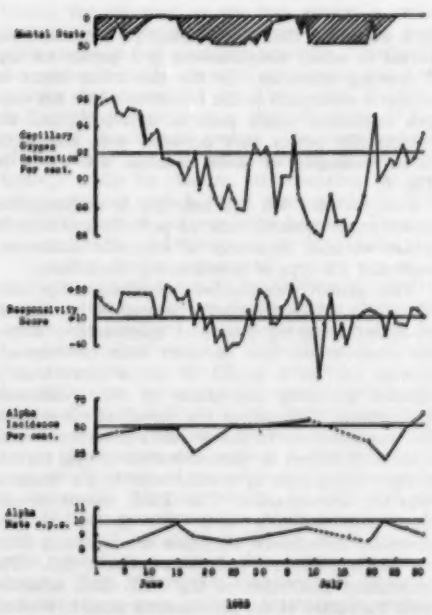


FIG. 6.—Case 2.—Concomitants of the stupor pattern in a patient with different time-relationships from those of Case 1.

of from 93%-95% dropped to from 89%-92% during periods of irritability or excitement, the range of the stress responsivity score running between + 10 and + 30, and — 16 to + 6 for these times respectively.

Comment.—In all 3 patients in this small but longitudinally studied group, a close relationship between phasic changes of the clinico-pathological condition and those of the EEG pattern and of the oxidative metabolic status was a common finding. Perhaps most closely correlated with the consciousness variations characteristically displayed in each patient were the alpha frequency and the resting capillary blood-oxygen saturation level. That the mechanisms involved are complex is obvious from the details which differ in each case. Accepting these differences as representative of individual attempts at homeostasis in the face of dysrhythmically recurring episodes of stress, some interpretation may help to integrate the cases in the light of our findings.

Homeostasis in Case 1 (Fig. 3) appears most satisfactorily achieved in the remission phase of the illness. Mrs. E. Y. is relatively the least clinically disturbed of the 3 patients

and it is noteworthy that her remission phases are not only longer but of a better quality than those of the other 2 patients. This apparent adequacy of adjustment is reflected in the relative constancy of both the oxidative and EEG data at these times. Triggered however by mechanisms at present unknown, the biological balance becomes unstable at certain periods and, along with phasic alterations in the levels of awareness, there may be also observed, in the prestupor state of progressively impaired equilibrium, a disruption of homeostasis which is reflected in an unstable, slowing alpha rate, bursts of medium to high voltage 4-6 c.p.s. waves, and a staircase fall in the capillary blood-oxygen saturation. This period of dysharmony is probably identical with that described by Hill(11) and confirmed by Leiberman and Hoenig(12) as occurring in catatonia and which is characterized by an increased propensity to "epileptiform" discharge. In the case of Mrs. Y. it apparently represents that biological constellation upon which a "disturbed phase" of psychomotor retardation may develop, the appropriate "tissue competence" of the experimental embryologists. With the onset of stupor in this patient, the vegetative balance slips markedly in an adrenergic direction. The patient becomes tense and anxious, the alpha rate increases markedly, and the anoxaemia and responsivity score plunge to even lower levels. It is assumed that this period represents an adaptation failure in the face of stress, in the same fashion as the following poststupor period represents the phase of readjustment back to normal.

By contrast with this pattern, the most marked periods of fluctuation seen in Case 2 (Fig. 5) are found around the end of the semistupor phase. It may be assumed that this phase of the cycle represents a period comparable with the prestupor phase of Case 1.

At the peak of their clinical disturbance, it has been noted that both Cases 1 and 2 manifest a stupor in terms of their psychomotor condition. The former patient becomes tense, rejecting, irritable, hostile, and anxious while the latter is mainly docile, placid, and relaxed, vegetating in an all-embracing phantasy world of wish-fulfilling dreams. This difference may account for the antipodal shift in their alpha rates: fast in the case of Mrs. Y., slow in that of Mr. H. The finding of an increase in the alpha frequency during the often violent catatonic excitement of the third patient would imply the same tendency.

THE EFFECTS OF THYROID HORMONE

The patients investigated have been the subjects of numerous therapeutic experiments. In one of these (Case 1) the exhibition of thyroid extract by mouth was monitored physiologically over a period of 10 months. Figure 7 illustrates a section of this observation period and demonstrates a remarkable and important finding.

It shows quite unequivocally that, despite the reasonably complete clinical inhibition at times when 2 stupor phases were chronologically expected to appear, the physiological changes which had been found normally to accompany the stuporous condition still mirrored the cyclic phases of the patient's metabolic rhythm. Together with a capillary anoxaemia of 87% blood-oxygen saturation,

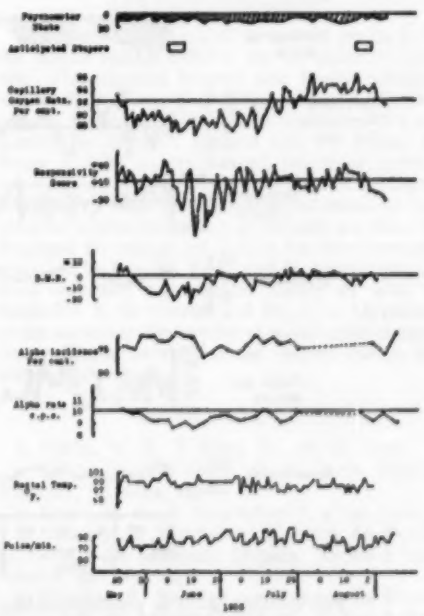


FIG. 7.—Case 1.—The inhibition of 2 chronologically expected stupors by thyroid hormone.

the responsivity score fell markedly to −90, the alpha incidence dropped from 90% to 65%, but the alpha rate diminished from 10 to 8.5 c.p.s. In addition to these changes, characteristic variations in the oxygen consumption and other clinically, biochemically, and endocrinologically determined values were observed, some of which are recorded in Fig. 7.

Comment.—In the light of this evidence it is obvious that none of the physiological measures reported in this communication as typically accompanying the cyclic mental state changes can continue to be so regarded. It is, however, also obvious that such measures do reflect a most significant series of biological happenings in the sphere of rhythmically determined phasic homeostatic adjustments out of the totality of which the minor fluctuations of the mental state must be considered a resultant. It is quite possible that observations such as these may throw future light on the complex metabolic interrelationships accompanying the psychological aspects of stress in syndromes other than periodic catatonia, such as cyclothymia and in the processes contributing to consciousness.

METABOLIC CONCOMITANTS OF ATYPICAL STUPOR PATTERNS

Atypical stupors can conveniently be studied in patients with the synchronous syntonic variety of periodic catatonia since they are distinguished by a far more stable rhythm of disturbance. In our series, Case 2 was the best representative of this variant, and in the course of 14 months of study, Mr. H. displayed 2 examples of prolongation of the stuporous condition enduring for 8-10 weeks instead of the 10-day period characteristic for him. Figure 8 illustrates the metabolic happenings of the second of these prolonged disturbances, along with the findings for the 2 more typical stupors immediately preceding it.

The physiological data suggest that this prolonged stupor essentially represents a series of catatonic stuporous disturbances which follow one another with insufficient metabolic change during the compressed "interval" phases to permit the emergence of a clinical remission. Oximetrically, an alternation at the tenth, thirty-fourth, sixtieth, and seventy-fifth days from the com-

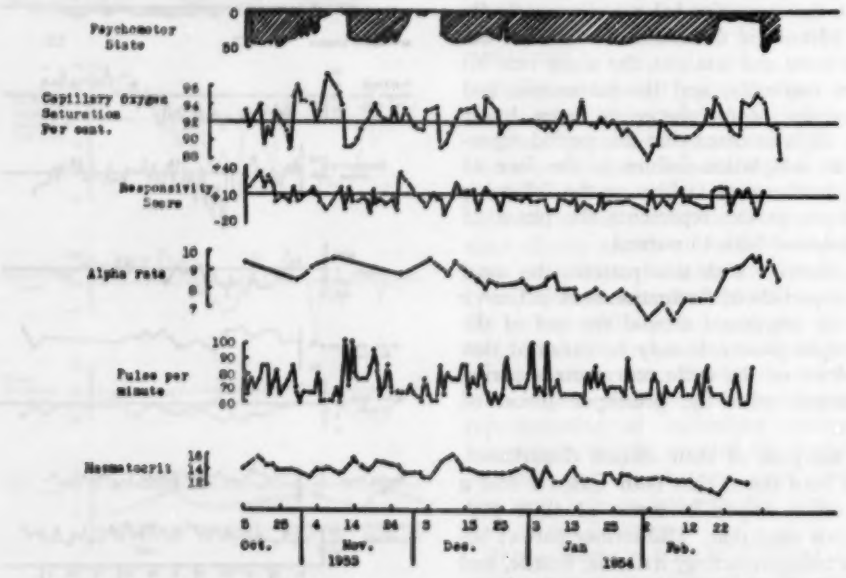


FIG. 8.—Case 2.—The psychophysiology of a prolonged stupor. Note that this particular stupor may be considered as the compression of some 5 separate disturbed phases which exist with insufficient interval between them to permit a "clinical" remission.

mencement of the prolonged disturbance can be discerned, and these variations may be glimpsed as reverberating through some of the other modalities of function shown on the chart. As with the findings in the more typical stupors, the variations seen in the prolonged disturbance fluctuate in quality, in persistence, and in intensity, their more major degrees being separated more widely in time than their secondary minor variations.

Comment.—It is probable that an individually determined degree of tissue preparedness is needed before a metabolic complex of change is capable of exerting a clinically observable alteration in the psychomotor state. The natural history of the course of periodic catatonia suggests that, however regular the timing of the rhythmic disturbances, dysphasic happenings will gradually summate to throw this timing out of phase and thus lead to a temporary (but sometimes lasting) period of pattern change. It may be that the resultant of this dysrhythmia is a prolonged stupor such as has been described. It may equally be that a condition of relatively permanent catatonic stupor will persist, such as is seen in the apparently nonperiodic catatonic schizophrenias. Or it may be that a relatively permanent remission from the disorder may supervene. The determinants of such intrinsic pattern changes in an otherwise inexorably phasic disturbance may well be extrinsic and dependent upon such well recognized factors as intercurrent infections, shock treatment, and the like.

Summary

1. A longitudinal clinico-physiological study in the kinetic tradition has been made on 3 cases of periodic catatonia over a 2-year period. Twice- or thrice-weekly EEG records were analysed mainly for alpha rate, incidence, and amplitude, and for activity in other frequency ranges; daily estimations of the capillary blood-oxygen saturation under both resting and stressful conditions were made by an oximetric technique; and the results of all these measures were assessed in terms of objectively recorded changes in the psychiatric state and of other metabolic happenings similarly investigated.

2. In all 3 patients it was found that, starting from a relatively normal baseline in the remission phase, fairly consistent physiological changes occurred with the onset of stupor or catatonic excitement. Both the EEG alpha incidence and alpha amplitude fell sharply and simultaneously with the appearance of a disturbed phase, while the alpha rate rose steeply in 2 patients and decreased in the third at this time. In the periods of semidisturbance, whether these occurred before or after actual stupor or excitement, intermediate changes were seen.

3. A similar cycle of disturbance, closely corresponding to the changing psychomotor state, was noted oximetrically. Stupor or excitement was accompanied by capillary anoxaemia and a fall in the stress responsivity score. Both these variables underwent a recovery as the clinical condition remitted.

4. The metabolic concomitants of atypical stupor patterns and of the exhibition of thyroid extract were analysed in similar fashion and a tentative hypothesis linking these findings to the patients' varied attempts to achieve an homeostatic equilibrium in the face of stress is offered.

ACKNOWLEDGMENT

This work was supported in part by grants from the Mental Health Fund of the Dominion of Canada. The personal interest and kindly criticism of Dr. Rolv Gjessing provided a unique stimulus both to the investigation and its reporting. We are indebted to Mrs. D. Johnson and the Misses E. Bregg and G. Sagert for the important nursing arrangements; to Mr. B. Eglitis, Mrs. H. Scrivener and Miss C. Baky for the specialized technical biochemical assistance; to Mr. M. Wyand and Miss H. Haviland for taking 396 EEG's for this investigation; and to Drs. M. Salna and R. Lippert for the daily oximetric assessments. Lastly we wish to thank Dr. A. G. Gornall and Dr. J. A. Dauphinee of the university department of pathological chemistry for those estimations not carried out in the hospital laboratory.

BIBLIOGRAPHY

1. Ashby, W. R. J. Ment. Sc., 98: 81, 1952.
2. Davis, H., and Davis, P. A. Arch. Neurol. Psychiat., 36: 1214, 1936.
3. Davis, P. A. J. Neurophysiol., 4: 92, 1941.
4. Gjessing, R. Beiträge zur Kenntnis der Pathophysiologie des katatonen Stupors. Archiv f. Psychiatrie, 96: 319, 1932.
5. Gjessing, R. Beiträge zur Kenntnis der Pathophysiologie des katatonen Stupors. Archiv f. Psychiatrie, 96: 393, 1932.

6. Gjessing, R. Beiträge zur Kenntnis der Pathophysiologie der katatonen Erregung. Archiv. f. Psychiatrie, **104**: 355, 1935.

7. Gjessing, R. Beiträge zur Kenntnis der Pathophysiologie periodisch katatoner Zustände. Archiv f. Psychiatrie, **109**: 525, 1939.

8. Gjessing, R. Beiträge zur Somatologie der periodischen Katatonie. Archiv f. Psychiatrie u. Zeitschrift Neurologie, **191**: 191, 1953.

9. Gornall, A. G., Eglitis, B., Miller, A., Stokes, A. B., and Dewan, J. G. Am. J. Psychiat., **109**: 584, 1953.

10. Hardwick, S. W., and Stokes, A. B. Proc. Roy. Soc. Med., **34**: 733, 1941.

11. Hill, D. Folia. psychiat. neurol. et neurochir., Neerl., **51**: 95, 1948.

12. Leiberman, D. M., and Hoenig, J. J. Neurol. Neurosurg. Psychiat., **16**: 194, 1953.

13. Lovett Doust, J. W. Proc. Roy. Soc. Med., **44**: 347, 1951.

14. Lovett Doust, J. W. J. Ment. Sc., **98**: 143, 1952.

15. Lovett Doust, J. W. Dis. Nerv. Syst., **14**: 259, 1953.

16. Lovett Doust, J. W. J. Clin. Exper. Psychopathol., **14**: 113, 1953.

17. Lovett Doust, J. W., and Leigh, D. Psychosomat. Med., **15**: 292, 1953.

18. Lovett Doust, J. W., and Schneider, R. A. J. Ment. Sc., **98**: 411, 1952.

19. Lovett Doust, J. W., and Schneider, R. A. J. Ment. Sc., **98**: 640, 1952.

20. Lovett Doust, J. W., Schneider, R. A., Talland, G. A., Walsh, M., and Barker, G. J. Nerv. Ment. Dis., **117**: 383, 1953.

21. Malamud, W., and Sands, S. L. Am. J. Psychiat., **104**: 231, 1947.

22. Ray, G. B. Am. J. Physiol., **147**: 622, 1946.

23. Ray, G. B., Johnson, J. R., and Ray, L. H. Am. J. Physiol. **147**: 636, 1946.

24. Rowntree, D. W., and Kay, W. W. J. Ment. Sc., **98**: 100, 1952.

DISCUSSION

I. Boszormenyi-Nagy, M. D. (Chicago, Ill.).—There are many ways of observing physiological phenomena as they appear in mentally ill patients. It is a rather discouraging enterprise to try to obtain a synthetic or synoptic picture of all physiological findings that have been described as observed in schizophrenic patients.

In the overwhelming majority of publications the authors correlate their biological findings with a category of patients which they or their psychiatrist coworkers classify as "schizophrenic." In very few cases is there given any descriptive characterization of the cases as to the criteria of the diagnosis of schizophrenia. These criteria, however, vary among investigators and conceivably comprise various conditions even in the same investigator's material. This circumstance may account for a number of conflicting findings concerning the same variables in so-called schizophrenic patients. The only way of eliminating this danger is to define sharply the kind of schizophrenic condition that is meant by the respective authors. In many cases the only possible way to do so is to give careful description of the symptomatology of every patient for the existing subgrouping of schizophrenic cases cannot be considered as relevant to etiological or biological entities.

The present paper selects a condition, maybe the best defined within the schizophrenic spectrum. The first fundamentally important observations on the metabolic correlates of periodic catatonia were published by Gjessing in 1932. He found that the nitrogen balance of these patients, if they were kept under well-controlled dietary and life conditions, showed an isochronous periodicity with the phasic changes of clinical disturbance and health. The early findings of Gjessing have been confirmed by numerous authors in various countries.

That these cases are hard to find is more than compensated by the possibility of using their numerous healthy interval phases as controls for comparison with the psychotic phases. This, however, requires a considerable amount of patience and tenacity to maintain the controlled conditions for many months and even years until even a small number of periodic catatonic cases can be screened and adequately observed. For their effort to take the high road, the Toronto group should be congratulated.

The authors have been willing to conduct their research on new physiological variables while still observing those variables which have been described earlier. In searching for new correlates and attempting to relate them to the old, they do a twofold service to science.

It would be interesting to see how the periodicity of the EEG changes and of the oximetric changes correlate with the fluctuations of the nitrogen-balance and of the NaCl excretion. According to the most recent work of Gjessing the NaCl excretion periodicity may be even more closely correlated with the clinical periodicity than is the fluctuation of the nitrogen retention.

The physiological interpretation of the findings is hardly possible at the present time. Data on changes of both observed physiological variables may represent indirect signs of rather complex biological happenings. An eventual elimination of the subjective elements of the oximetric measurements may in future add to the usefulness of the data. While assessing the implications of these observations we cannot help but think of the possibility that physiological differences between the healthy and psychotic phases of periodic catatonics may bear relevance to the mechanism of other schizophrenic and schizophreniform conditions. In any case, we look forward hopefully to learn of new findings from the Toronto Institute.

MARGINAL MANPOWER IN THE MILITARY FORCES [1, 2]

CAPTAIN E. L. CAVENY (MC), U. S. NAVY,[3] WASHINGTON, D. C.

In all future national emergencies we shall be confronted with the crucial problem of manpower shortage. It behooves us therefore to be fully acquainted with the significance of that problem. Manpower shortage necessitates the use of marginal or handicapped individuals in both military and civilian mobilization, and their presence has definite repercussions on the structure of any group organization.

The term "marginal manpower" refers to individuals who do not measure up to the desired standards because of some defect, physical or psychiatric. These defects are not of sufficient intensity or degree to render the individuals true casualties, but do cause difficulty in their keeping up with the so-called normal individuals. Were there no manpower shortage, these individuals would not be enlisted into the service. However, they are accepted as calculated risks, creating added drains on hospital, disciplinary, and training facilities.

It is a commonly held belief that the natural resources and economic reserves of the United States are inexhaustible. There are, however, certain commodities and resources that are always in scarce supply throughout the world in time of war. One of these is manpower. Another, even in the United States, is that of personal liberty guaranteed the individual under the democratic way of life. The protection of personal liberty from those at home who would destroy it is a problem for the citizenry with their weapon, the ballot box. When, however, this possession is threatened from outside our own country, its protection becomes the major military concern. It is from such a threat that our country has been conditioned throughout the years to rise to a national emergency, which, in turn, calls for manpower in all categories.

In earlier wars, the presence of marginal individuals was far less disrupting and disturbing to the functioning of a military group than today when, in this highly technical and specialized age, everyone must be prepared to get aboard the mechanical band wagon. The marginal man experiences difficulty in doing this. There is much difference between the intellectual demands made on the foot soldiers of a few years back and those made today on military service personnel who are required to operate the highly technical electronic devices used in modern war. By virtue of these increased intellectual demands, the number of marginal personnel is much larger. Still, the marginal group must be used, to what extent depends upon the exigencies of the situation and degree of manpower shortage.

The marginal man most frequently wants to be used. He has as great a sense of patriotism as anyone else and is as desirous of serving his country, whether it be in the presence of unconscious anxiety and fears or a conscious realization of inadequacy. Unfortunately, the determining factor in the successful use of the handicapped person is not always proper billet placement, but is his conscious or unconscious motivation to serve. The experienced medical observer has repeatedly shown that the effectiveness of the physically and mentally handicapped individual is primarily determined by his motivation for further duty. Psychogenic aggravation of handicaps results in incapacitations which cannot be remedied by the strictest of discipline or by the best leadership. Thus, one of the greatest problems in using the handicapped person is to help him live with his disability rather than achieve ulterior goals through conscious or unconscious manipulation of the environment by means of his defect. If, however, through a "selecting-in" program he can be placed in satisfactory employment, he not only will be fulfilling a service to his country but will be fulfilling a service to his ego.

[1] Read at the 110th annual meeting of the American Psychiatric Association, St. Louis, Mo., May 3-7, 1954.

[2] The opinions expressed are those of the author and do not necessarily represent the opinion or policies of the Navy Department.

[3] Head, Neuropsychiatry Branch, Professional Division, Bureau of Medicine and Surgery, Navy Department, Washington 25, D. C.

Looking back over the relatively few years that psychiatry has participated in manpower selection, one is impressed by what appears on the surface to be an enormous amount of lost motion with relatively little forward progress. This appears to be particularly the reason why manpower shortage has necessitated use of marginal personnel. Psychiatric undertakings in this area have been profitable, however, and current research projects are continually bringing forth gains that were heretofore hidden.

Over the past few years the neuropsychiatry branch of the Bureau of Medicine and Surgery has conducted an elaborate research program pertaining to the selection and performance of naval personnel, with particular emphasis on the marginal or substandard group. Thousands of methodized objective records of service personnel have been scientifically studied and evaluated, and many factors have been clearly and conclusively revealed: (1) The desirable objective of excluding all men from the military service who might become psychiatric casualties can be done only by excluding too great a segment of manpower resources; (2) in determining success or breakdown in military personnel much greater emphasis must be placed on the stresses and supports of the environment in which the individual finds himself, rather than on the application of clinical concepts to matters of military service, or on attempts at paralleling conditions in civilian and military life, with, of course, due consideration to individual personality; (3) use of the marginal group is not only feasible but necessary when, in such exigent situations as war, there is a manpower shortage; (4) a "selecting-in" program of service personnel is more desirable and effective than a "screening-out" program; (5) the presence of marginal individuals makes the incidence of hospitalization and disciplinary difficulties much higher, even though these men meet group adjustment standards; (6) there are great and hidden costs for additional medical, disciplinary, and training facilities demanded by this group; (7) statistics are being compiled which furnish a basis for determining the feasibility of expenditures for the reclamation of certain types of marginal manpower and for determining the point at which it is most advisable to stop; and foremost (8) research in this area is a continuous process if the military services are to keep abreast the current era. From this research it is being affirmed that the attitudes, thinking, and intellectual preparation which may have served well in the past are not good enough to serve satisfactorily in the future. Requirements demanded of military personnel in the coming era will be particularly exacting.

Screening at the induction stations during World War II was a miserable failure. Even though considerably more than a million men were rejected for military service because of psychiatric defects, there were another million who were discharged therefrom because of psychiatric conditions. Despite all the effort expended and the high promise held out for induction station screening, the psychiatric incidence rates in the military services during that war reached an all-time high. Studies following World War II have strongly indicated that a large percentage of the persons rejected for psychiatric reasons probably could have served satisfactorily(1, 2, 3), while other studies(3) have indicated with equal strength that a large number of those who were discharged during that war probably could have successfully remained.

A comparison of the rejection rates of World War II and the Korean conflict reveals that in recent years there has been a more effective utilization of manpower, especially with respect to marginal individuals (Fig. 1). Psychiatric rejections for the military service in World War II, 1942-45, accounted for approximately 24% of all medical rejections, as opposed to 12.8% during the Korean incident, 1950-53. Of the total Navy and Marine Corps medical discharges for the same periods, the psychiatric percentages were 34% and 38% respectively. This means that during the process of absorbing 11.2% more psychiatrically-marginal individuals during the Korean incident years, the discharge rate was increased by only 4%. The remaining 7.2% completed a normal period of naval service, even though exerting greater demands on medical, disciplinary, and training facilities, as reflected in the incidence, or hospitalization rate.

The incidence rate of psychiatric disorders

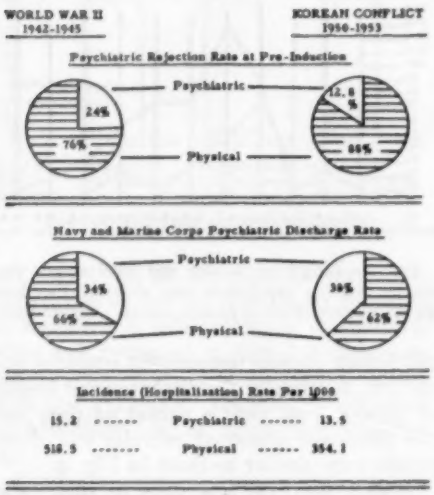


FIG. 1.—Comparison of periods 1942-45 and 1950-53 as to rejection, discharge, and incidence rates.

in the Navy for World War II was greater than for the Korean conflict, even though in the latter, there was an increase of 11.2% of psychiatrically marginal personnel. There are some variations in the type of disorders for the 2 periods, which are largely explained by the change in the armed services nomenclature instituted in 1949. The new nomenclature gives greater leeway in the use of the character and behavior disorders, as well as containing the diagnostic title, "Acute Situational Maladjustment," both of which absorbed a considerable number of the otherwise would-be psychoneurotic diagnoses. Still, the total difference was relatively small, 15.1 as against 13.5 per 1,000.

With the recent 50% reduction in psychiatric rejection rate during the Korean period, had it not have been for a more effective selection program at the various Navy and Marine Corps training centers, the incidence rate for mental illness would probably have surpassed that of World War II. This "selecting-in" program, however, permits the screening-out of the unfit after a trial at duty under observation and supervision, and after demonstrating an inability to perform, rather than on snap decisions at induction. World War II was an all-out patriotic effort, while the Korean incident was frankly considered an "unpopular war." The latter conflict was carried on under a personnel rotation policy of 2 years' active duty, with the economic, scholastic, and other rewards of the G. I. Bill constantly confronting the individuals at the completion of that period. Such factors as the rapid turnover of personnel and the second war being fought in the same generation soon brought about a depletion of the available manpower pool which necessitated the lowering of enlistment and induction standards, and the early utilization of substandard or marginal personnel. While both the physical and mental standards were lowered, the effect was primarily that of bringing into the service a greater number of the psychiatrically substandard group. When it is necessary to lower the physical and mental standards for the military service, repercussions are rapidly felt throughout, especially with respect to the hospital admission rate.

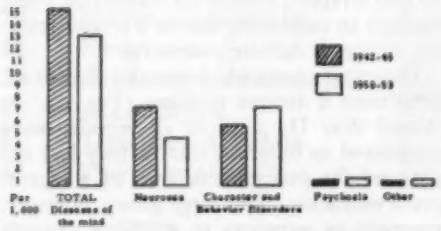


FIG. 2.—Comparison of average incidence rate of psychiatric disorders during period 1942-1945 and 1950-1952.

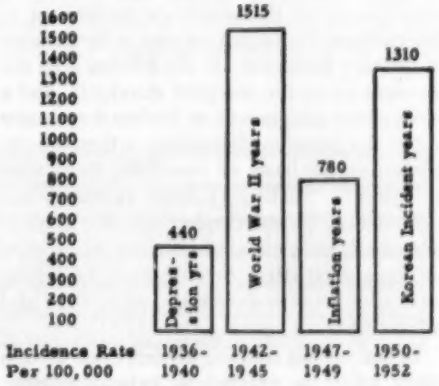


FIG. 3.—Annual incidence rate for diseases of the mind as reflected by changes in induction and enlistment standards.

During the depression period of 1936-40, the military services had a very high degree of selectivity, both as to intellectual and physical standards. The period 1947-49 continued as inflation years and the rewards in civilian life and from the G. I. Bill of Rights rendered military employment undesirable (See Fig. 3.)

Earlier manpower research in the Navy was limited primarily to selection procedures for individuals most likely to function efficiently under stresses of wartime conditions. That program was directed at a more effective elimination or "screening-out" process. At that time, the major concern in the utilization of the marginal group had to do with the individual's ability to successfully complete a so-called normal period of duty without breaking down. Surprisingly, little attention was paid to the quality of service rendered. Today, research emphasis is on determining a method not only of "screening-out" more effectively and less wastefully the individuals likely to break down, but of "selecting-in" all personnel for a type of job assignment whereby an adjustment to military life is more readily and firmly facilitated, and with the highest degree of efficiency.

This "selecting-in" program is conducted at the Naval and Marine Corps training centers where the recruit spends the first 11 weeks of his military life. It is in this setting and while on a duty status that he is observed as to behavior and performance. The effects of the various stresses and supports of the environment at this stage are paramount in determining the future success or breakdown of military personnel. If the selectee does not measure up to the accepted standards, and a satisfactory assignment on limited duty seems out of the question, disposition is then accomplished on the basis of something more than a "guess." Studies(3) have revealed that there should be less emphasis on the application of clinical concepts to matters of military service and on attempts at drawing too strong a parallel between conditions in civilian and military life.

In the recruit training center, even though every effort is exerted in extending emotional support to the individuals in their newly acquired military environment, there still persist various unavoidable stressful situations. A study of the discharge and length of service rates over a period of time for any particular group of recruits will show results very similar to those in Fig. 4.

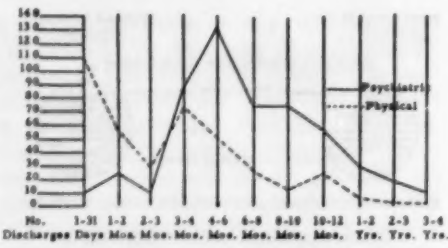


FIG. 4.—Length of service and local action discharge rate for psychiatric and physical disorders for all recruits in a one month period—August 1952.

Within the first few days in their new environment the majority of physical defects are discovered and eliminated. Psychiatric-wise, essentially all individuals are placed on duty and it is then, from a period of observation of their behavior and performance, that the majority of psychiatric conditions are discovered. During this particular period, other physical conditions are brought to light through organ responses to emotional stress encountered. This is portrayed in Fig. 4 by the second elevation on the physical line. Assuredly, even under the best of conditions and concerted efforts, there is considerable stress encountered in the early days of military life. For an 18-year-old person to be suddenly uprooted from his home and his self-created environment—one that is so well typified through the appearance and sanctuary of his own personal room—and with equal suddenness to find himself many miles away in the midst of total strangers, stripped of all individuality, even to the extent of only a towel wrapped around his midsection going through an examining line at a recruit training station, is definitely stressful.

Illiteracy, a term which remains ill-defined, constitutes a distinct problem (Fig. 5). In World War II, 3.4% of all recruits were considered as illiterate, that is, they had not achieved the performance level of a fourth-grade education. This large group, however, averaged an exposure to schooling through the fourth grade. From this 3.4% illiterates, there came 9.6% of all disciplinary cases,

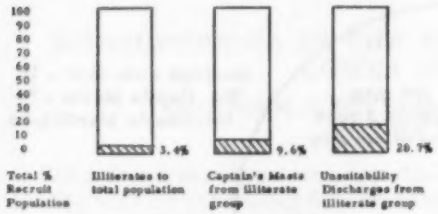


FIG. 5.—Illiteracy in recruit training.

and 20.7% of all unsuitability discharges. Today, the lack of an opportunity to obtain an education is less prominent in illiteracy, while such factors as emotional disturbances, lack of motivation, and psychiatric illness are more prominent. Illiteracy is not infrequently diagnostic of personality disorders (4).

A comparison study was made of a group of marginally adjusted individuals with a control group of normals (Fig. 6), both successfully completing a period of 1½ years of naval service(5). These cases were originally studied by the psychiatric unit of the same training center and evaluation of each case was concurred in by at least 2 psychiatrists. This survey reveals that despite the successful completion of 1½ years of duty the marginal group had a much higher incidence of hospitalization and disciplinary difficulty.

In the calender year 1948, about 1.6% of all incoming recruits were recommended to the aptitude boards by the psychiatric units for discharge from the service. The boards, which are administrative and operated by line officers, did not concur in about 10% of the referrals, or 217 cases, and returned them to duty. A detailed follow-up (Fig. 7) study of each of the 217 cases was carried out over the entire 3-year period that followed(3).

One half of these individuals, 108, completed the 3-year period, but not one made an advancement to a petty officer rate. The other one-half, 109, was discharged with an average of only 9 months' service; 34 receiving medical discharge for psychiatric conditions, averaging 78 days each on the sick list and accumulating multiple disciplinary offenses; the remaining 75 receiving administrative discharges for one reason or another. Space does not permit consideration of details of the cost involved with this group of 217 individuals; however, if the 109 had been discharged at the time of medical recommendation, the approximate cost would have been 6,000 dollars as compared with a fairly accurate estimated cost of 36,000 dollars at the actual time of discharge following 9 months service.

In the utilization of marginal manpower we are deliberately taking more calculated risks, which means increased costs throughout, and all of which comes from the taxpayers' pocket. Thus, in times of manpower shortage, when the use of marginal personnel is inevitable, it behooves us to be prepared to employ this group to the greatest advantage with the least expenditure and disruption. This can be done only by long-range planning on the assumption that in all subsequent national emergencies the marginal, substandard, or handicapped individuals will be utilized. A sound nationwide mental health program will not only decrease the number of marginal personnel in the man-

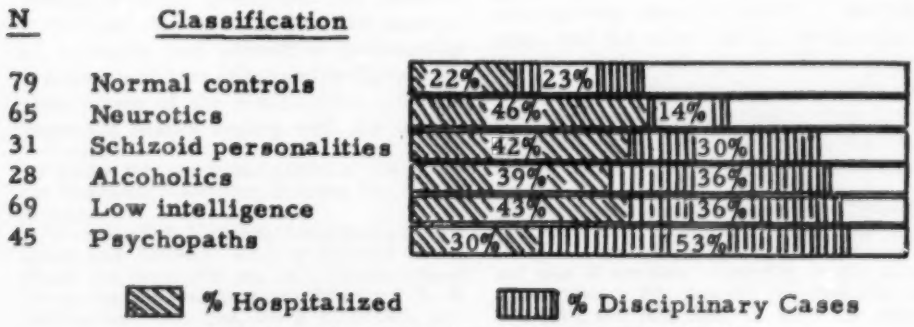


FIG. 6.—Comparison study of marginally adjusted individuals.

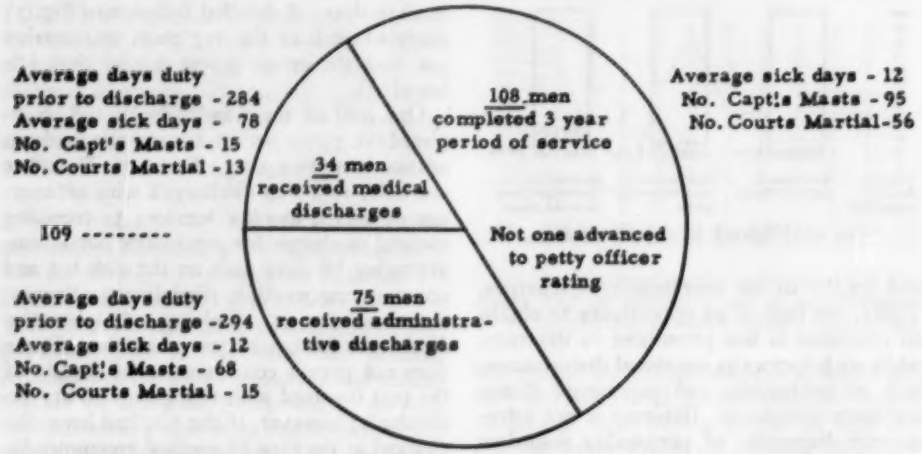


FIG. 7.—Subsequent history of 217 recruits sent to duty by administrative boards in nonconcurrence with medical recommendations—calendar year 1948.

power pool, but will greatly benefit all individuals in adjusting to the military environment.

In our constant struggle to accomplish broad social aims, let us not forget that there is one disaster that we must always guard against, and one our country cannot afford —the cost that would accrue to us if we lost our next war. While other goals may be established, the first objective of our country is to win its wars. Democracy is a homely, personal thing. Education for democracy is everybody's business and it requires the closest kind of cooperation between the military, the home, the school, the church, and the community.

BIBLIOGRAPHY

1. Egan, J. R., Jackson, L., and Eanes, R. H.: J. A. M. A., 145: 466, Feb. 17, 1951.

2. Brill, N. Q., and Beebe, G. W. Am. J. Psychiat., 109: 401, Dec. 1952.

3. Research studies conducted by the Neuropsychiatry Branch of the Professional Division, Bu. Med. and Surg., Navy Dept., Wash., D. C., 1949-1954.

4. Hunt, W. A., Wittson, C. L. Armed Forces M. J., 2: 365, Mar. 1951.

5. Hunt, W. A., Wittson, C. L. Personal communication—recent unpublished study.

SCHIZOPHRENIA IN THE YOUNGEST MALE CHILD OF THE LOWER MIDDLE CLASS [1]

BERTRAM H. ROBERTS, M.D., AND JEROME K. MYERS, PH. D.[2]
NEW HAVEN, CONN.

Since 1866 there have been many studies dealing with the relationship between family ordinal position and the incidence of mental illness(8, 19). The early emphasis placed on the difficulties of the only child and the first-born engendered a long dispute which was terminated with more advanced statistical techniques when Malzberg demonstrated that previous investigators had failed to consider the prevalency of the first-born in the general population(16). With the correction of this bias, the previous conceptions were largely discredited, leading to the current belief that ordinal position, by itself, does not determine a predisposition to mental illness.

Accompanying the incidence studies there has been continuous interest in the relationship between ordinal position and various traits of personality(12). However, when Murphy, et al., reviewed several hundred of these studies in 1937, they stated that the findings were highly contradictory and noncommittal. They felt that in the future it would be essential to relate the psychological study of ordinal position to broader aspects of family interaction(20). This policy has lead to the separate analyses of ordinal position according to sex, consideration of the order and spacing of the siblings, and studies of the relationship between the ordinal position and particular family contacts(18).

A further refinement has come with the recognition of the interplay of cultural factors in family interaction. For example, it has been demonstrated that our concepts of normality and preventive child-rearing practices have been influenced by the middle-class values of the clinician(13). Several important studies dealing with the rearing practices in the social classes of our society have shown that there is a wide difference between the middle and lower classes(1, 5). These trends in ordinal and class studies were combined by Sears in 1950 in his conception that ordinal position forms the basis of familial role differentiation calling forth a set of parent-child attitudes and practices; this role was then found to vary with the social class of the family(27).

The study to be described is oriented within this conceptual framework, as we attempted to locate a syndrome of conditions involving the individual when sex, social class, mental illness, and ordinal position are controlled. This analysis is part of a larger investigation of the relationship between social stratification and psychiatric disorder. The first phase of the research dealt with the treated prevalence of psychiatric disorder in metropolitan New Haven. In the second phase, reported here, several theoretical ideas emerging from the statistical findings were explored through a controlled case survey(11, 24, 25).

METHOD

This investigation has been called a controlled case survey since the cases were selected in the design of a 4-cell table split one way into 2 social classes and the other way into 2 diagnostic groups. Fifty cases were gathered, of which half were diagnosed as schizophrenic disorder excluding the latent state, and the other half as psychoneurotic disorder, using the latest official nomenclature. From the standpoint of social class the cases were drawn equally from 2 non-adjacient social classes, class III, the lower middle class, and class V, the lower class.[3]

[1] Read at the 110th annual meeting of The American Psychiatric Association, St. Louis, Mo., May 3-7, 1954.

[2] From the Yale University Departments of Psychiatry and Sociology, aided by USPHS Mental Health Act Grant MH 263 (R), "Relationship of Psychiatric Disorder to Social Structure," A. B. Hollingshead, sociologist, and F. C. Redlich, psychiatrist, principal investigators.

[3] The population of New Haven was divided into 5 classes using Hollingshead's *Index of Social Position* which is based upon education, occupation, and area of residence. According to this system, 3% are class I; 8%, class II; 21% class III; 50% class IV; and 18% class V. Class III includes proprietors, white-collar workers, and some skilled

In addition the patients were white, between the ages of 22 and 44, and equally divided between the sexes. These 50 cases were found to constitute a representative sample of the total psychiatric population of New Haven in terms of religion, ethnic origin and exact age distribution.

The method of inquiry consisted of a 129-page schedule of questions built around 14 areas of interest, including psychiatric and medical history, attitude towards psychiatry, family dynamics, sexual history, religion, ethnic origin, occupation, housing, education, recreation, class status, social mobility, and social identification. The schedule was constructed so that the questions were directed to the informant judged most capable of responding. Some items were duplicated to check the validity of the responses. Data for the schedule were gathered by a team of psychiatrists and sociologists in 5 or more interviews with the patient, at least 2 members of his family, and the therapist. Also, an unstructured clinical interview was conducted with the patient, and his clinical records were abstracted. Finally, Rorschach examinations were carried out for 9 patients in each class.

When the interviews were completed the raw data were transferred to an assessment schedule, and each case was considered entirely in terms of its own dynamic development(21). In the next stage, the individual areas of interest were compared between social classes and diagnostic categories. We are preparing a monograph dealing with the patient's development in the family; one aspect of ordinal position in the family structure is presented here and the other positions will be described in later papers.

FINDINGS

In reviewing the 50 cases it was found that 10 of the 13 males in class III were youngest boys, while only 4 of the 13 females were the youngest girl. In class V, 4 of the 12 males were the youngest boy and 3 of the 12 females were the youngest girl. In this paper we are concerned with the 10 youngest boys in class III, 5 of whom where schizophrenics and 5 psychoneurotic.

To explore the conditions surrounding the 10 patients, data from the assessment schedules were abstracted under the following broad headings: (1) relationship with mother; (2) relationship with father; (3) relationship with other siblings; (4) contact with peer groups in the community; and (5) age and stage of assuming responsibility. Approximately 50 common phenomena which we call attributes were located among the 5 schizophrenic cases. These attributes were then sought among the 5 neurotic cases and the remainder of the male cases in the series. The reliability of judgments concerning the presence or absence of the attributes was checked by 4 independent judges. After discarding 15% of the attributes, the level of agreement between the judges reached 93%. The findings are reported in terms of the percentage of cases in 4 subgroups: the youngest male, class III; other males, class III; youngest male, class V; and other males, class V, with the diagnostic dichotomy contained in each. By comparing these percentages it is possible to determine whether the attribute is related to ordinal position, class status, or diagnostic category.[4]

workers; they are mostly high school graduates. Class V includes unskilled and semi-skilled laborers, who have a grade school education or less, and who live in the poorest areas of the community.

[4] The Chi-square test was used to determine whether significant differences existed between frequency distributions. Actual numbers were used in the computations, and significance was defined at the .05 level.

Examples of the method of analysis follow. The attribute "patient spent more time with the mother than did the other siblings" occurred among 90% of class III and 100% of class V youngest males. However, it was found among only 50% of the other males in class III and 25% of those in class V. Since there is a significant difference in the occurrence of this attribute between youngest males and other males regardless of social class status, we conclude that the attribute is related to the patient's ordinal position. The attribute "mother had mobility aspirations" was found among 100% of the youngest and 67% of other class III males, but among only 25% and 0% of the corresponding ordinal positions in class V. Therefore, this attribute is associated with class III status rather than ordinal position. The attribute "father was inadequate" occurred in the following percentages among schizophrenic males: youngest class III, 100%; other class III, 67%; youngest class V, 100%; other class V, 60%. The corresponding percentages for neurotics were 33, 0, 0, and 0. Therefore, this attribute is characteristic of schizophrenics, regardless of ordinal or class position. All other attributes

Space precludes the presentation of the separate attributes; however, to provide an example, one attribute referable to the mother will be discussed in detail. This attribute is "spent more time with the mother than did the other siblings." This was based upon the following type of information in a condensed form: in the M Case, the patient was considered backward from his early years while his mother was very ambitious for his progress. Since the siblings were more sociable and active in the community and the mother extremely devoted to her tasks at home, the patient was left with her a great deal of the time. In the C Case the mother was a very ambitious and aggressive person who pushed all of the members of her family, especially the patient, who was the slowest of the siblings. On these grounds the mother was forced to work with him for a longer period of time leading to the attribute. In the I Case the mother was very closely attached to the children, being described as perfectly devoted to them. In the midst of this situation, the patient adopted the role of "his mother's right-hand man," which was apparently acceptable to her. The attribute was derived from such data as observed in these and other cases.

THE SYNDROME

Instead of presenting the remaining attributes in detail, a summary in the form of a coherent picture will be described representing the 42 attributes which were characteristic of the schizophrenic cases who were class III youngest males. Thirty-seven of the attributes were found in 100% of the schizophrenic cases and the remaining 5 in over 60%. A very similar pattern was found in the neurotic cases with 31 of the attributes occurring in at least 75% of the cases. Starting with the attributes referable to the mother, it was found that there was a close and distorted relationship with the mother which might be described as symbiotic, although the mother's reward was not very apparent(6). The mother's personality was distinctive as a rigid perfectionist who stressed disciplinary compliance. She was highly ambitious for her family's social advancement in the community. The patient spent more time with her than did the other siblings and in turn she devoted more attention to him. He became conforming to her demands and very dependent upon her, eventually assuming her social values as his own. As time passed the two formed a diffuse temperamental affinity in their emotional contact. With the onset of the illness, 3 of the 5 schizophrenics discarded their mother's value system in a brief rebellion.

In the relationships involving the father, there was tension and poor communication between the parents. The mother was the dominant partner as was clearly demonstrated at times of family crisis. In the community the father was an unsuccessful man who had trouble making friends and getting along with people, while at home he was quite uninvolved in household activities except as the executor of the most severe punishment. In the absence of actual achievements he tended to stress manly characteristics, especially in the demands he made of his slow-moving son. Hostility was exchanged between father and son as the father excluded the patient from his activities and concern. On the surface the patient was completely obedient to the father, but actually he rejected the father's values; at the last moment, however, he grasped for a few fragments of the father's characteristics as he descended into the illness.

A comparison of the patient's achievements with the older siblings showed that the latter were more successful in education, occupation, and social participation. In the developmental years the patient became submissive to them and much hostility was exchanged. An exception was found in a very close positive attachment to one sister which had a direct sexual expression in a few cases.

The analysis of his external relations showed that the patient lacked intimate friends which was quite apparent during adolescence when his previous acquaintances moved on to wider activities. Although he belonged to organizations, he formed no friendships in them. Over the years, his isolation increased, as his interests and hobbies grew more solitary. Sexual activity was ex-

were analyzed in similar fashion to determine the relative influence of ordinal position, social class, and type of psychiatric disorder.

tremely limited since there was little social dating or direct heterosexual contact. In terms of maturity and responsibility, the patient was noticed to be slower and more passive than the other children from early childhood, a status which was supported by illness and other physical handicaps in this period. During the school years, the patient did not exert adequate effort so that family support was continually required.

This description represents what we have called the social syndrome of schizophrenia in the youngest male of the lower middle class. However, the general trend towards interpersonal isolation with increased withdrawal was found to be a characteristic of the entire series of schizophrenic and neurotic patients.

The next stage in the analysis was to determine whether the attributes were related to ordinal position, social class, or schizophrenia. The patient's position as the youngest male child was related to the excessive time spent with the mother and the close dependent attachment which led to the assumption of her social values. In addition position seemed to account for the close attachment to the sister and the inferior, submissive feelings directed toward the other siblings.

Lower-middle-class status was correlated with the personality of the mother and the inadequacy of the father. Also, the sibling's achievements in education and occupation were typical of the social class as were the organizational activities of the patient. The general mobility of the patient's middle-class friends contributed to his isolation. Finally, the family's awareness of the patient's passivity seems to be a type of perception limited to the middle and upper classes.

It will be recalled that the syndrome was largely applicable to both schizophrenic and neurotic patients, but more intact in the schizophrenic. In comparing these 2 groups it was found that the characteristics of the father constituted a decisive difference in that his lack of participation in the home and hostile expression were much more apparent in the schizophrenic cases. Furthermore, the schizophrenics made only a preliminary approach to heterosexual relations. Finally, there was considerable difference in their achievement as compared with their siblings, since the patients never became established in adult pursuits.

Discussion

Since the syndrome merely represents an attempt on our part to establish a coherent logical connection between the attributes, an effort was made to locate comparable studies in order to assess the relevancy and importance of this picture.

In 7 studies we found descriptions which bear a close resemblance to our group, the most extensive being David Levy's monograph on the overprotective mother. To select a few points of similarity, he stated that these mothers had a personality resembling an obsessive neurotic. He described the parents' lack of a shared social life and the wholesale isolation of the patient.(15). Tietze mentions the overprotective perfectionism of the mother, the compliance of the son, and his close attachment to an elder sibling. She also stresses the general inadequacy of the patient's heterosexual development(28). McKeown found an antagonistic-demanding relationship with the father who stressed athletic and occupational achievement while the mother failed to provide adequate support for the child throughout his development(17). One-half of the children whom Kasanin found were later to become psychotic had been considered queer, peculiar, and passive in their early years, calling for the protective solicitude of the mother and older siblings(13). Bowman found that there was a great distance between the patient and the other siblings with the exception of 1 or 2 close attachments. He also remarks on the patient's increase of solitary reaction in adulthood(4). Gerard and Siegel stressed the dependency and general incapability of their patients of accepting adult responsibility. The mother was the dominant person in the family and the father weak, immature, and passive(9). Reichard and Tillman found that the mothers of schizophrenic patients who were overtly rejecting or smothering were married to men who were quiet and ineffective. A separate category was established for domineering sadistic fathers whom they called schizophrenogenic. They found, as in our study, that the family conditions were more severe in

the schizophrenic cases than in the neurotic (26). This cursory review of the literature represents a very small fraction of the findings of these studies. From this comparison we conclude that the syndrome we described conforms with an evolving delineation of the social-personal relations concomitant with the development of schizophrenia in male patients.

Within this syndrome it is now our task to consider the significance of the variables held under control: ordinal position, social class, and diagnosis. The previous studies of the families of schizophrenics made very little mention of ordinal position, with the exception of Gerard and Siegel, who stated that their patients generally held a special position in the family referring in part to ordinal status(9). Our findings indicate that the intensity and extent of contact with the mother were supported by the ordinal position as the mother seems prone to act in a protective manner when she observes slowness and passivity in her youngest boy. Also it might be expected that the youngest boy will have submissive and inferior feelings for his older siblings at some stage of his development; our patients were never able to overcome this handicap.

The significance of social class has widespread importance in our findings. Early studies of mother-child relationships in mental illness emphasized the rejecting actions of the mother, but as stated by Meltzer, we found that this type of overt aggressive behavior is probably limited to the lower class (18, 22, 23). Supporting this we found that the mothers in David Levy's series who were overprotective rather than rejecting were mainly middle class according to a close examination of his sample(15). In considering the relationship of social class to the fathers' behavior we found that their failure to advance in the occupational and social activities of the middle class tended to support the general impression they created of being failures as men. Aberle and Naegle have described the manner in which middle class fathers establish an identification with their sons and strive for their advancement; our cases demonstrate the consequences of the failure of this aspiration(2).

In a negative direction we observed that differences in family interaction based on ethnic origin were reduced in the middle class as the family presses for assimilation into the American system(3). However, middle class status does provide the educational and occupational objectives of the siblings' superior achievement. Also, middle class emphasis on social activities runs contrary to the solitary tendency of the patients. Finally, social class was found to be related to the perfectionistic disciplinary attitude of the mother and her mobility strivings. This raises the interesting question of the relationship between social class and character structure as the obsessive character of the mother apparently finds this form of expression in the middle class where ample time is available for household duties and the care of the children.

A comparison of the schizophrenic and neurotic patients indicates that there is a gradient into the syndrome with more severe interpersonal relationships in the schizophrenics followed by a more regressed decompensation. The punitive hostile relationships with the father was the principal difference between these diagnostic categories. This is of importance as the paternal role is changing with the rising status of women and the increase of leisure time bringing the father in closer contact with the rearing of the children. The remaining findings dealing with the sexual retardation and the immature social accomplishments of the schizophrenic are generally regarded to be secondary manifestations of the disease process.

We believe that the implications of our study with reference to the validity of psychoanalytic theory are minimal, since there is very little information dealing with the first 5 years when the fixations are believed to occur. From Freud's earliest writings, references were made to the consequences of the fixations on family interaction, and Flugel has expanded this suggestion into an integrated picture of family life. We did not find any significant conflict between Flugel's theoretical scheme and the syndrome which has been described. Of crucial importance to us is his suggestion that a parent's ill-feelings for a child can be converted into an identification with the child

which would explain the mother's pressure on her passive son(7).

In summary it is our opinion that there is sufficient similarity between our cases in important elements to support the delineation of a social-psychiatric situation. The method described has made it possible to isolate aspects of the situation related to family structure and the social environment. In this analysis the unexpected finding regarding the role of the father in the schizophrenic cases was demonstrated. It is our opinion that this set of findings is still the material of hypotheses calling for further investigation which we hope to follow or stimulate among those who read this paper.

BIBLIOGRAPHY

1. Anderson, John E. Young Child in the Home. New York: Appleton-Century, 1936.
2. Aberle, David F., and Naegel, Kaspar D. Am. J. Orthopsychiat., **22**: 366, 1952.
3. Barrabee, Paul, and von Mering, Otto. Social Problems, **1**: 48, 1953.
4. Bowman, Karl, M. Am. J. Orthopsychiat., **4**: 473, 1934.
5. Davis, A., and Havighurst, R. J. Pp. 252-64 *in* Personality in nature society and culture, ed. by C. Kluckhohn and H. A. Murray. New York: Knopf, 1948.
6. Dunbar, F. Am. J. Orthopsychiat., **22**: 809, 1952.
7. Flugel, J. C. The Psycho-analytic Study of the Family. London: The International Psycho-Analytical Library, Hogarth Press, 1929.
8. Galton, F. English Men of Science: Their Nature and Nurture. London, 1929.
9. Gerard, Donald L., and Siegel, Joseph. Psychiat. Quart., **24**: 47, 1950.
10. Henry, Jules. Am. J. Orthopsychiat., **19**: 665, 1949.
11. Hollingshead, A. B., and Redlich, F. C. Am. J. Psychiat., **110**: 695, 1954.
12. Jones, Harold E. Pp. 204-24 *in* Handbook of Child Psychology, ed. by Carl Murchison. Worcester: Clark University Press, 1931.
13. Kasanin, J., Knight, Elizabeth, and Sage, Priscilla. Nerv. and Ment. Dis., **79**: 249, 1934.
14. Krout, M. H. J. Gene. Psychol., **55**: 3, 1939.
15. Levy, D. M. Maternal Over-Protection. New York: Columbia Univ. Press, 1943.
16. Malzberg, Benjamin. Am. J. Phys. Anthrop., **24**: 91, 1938.
17. McKeown, James E. Am. J. Sociol., **56**: 175, 1950.
18. Meltzer, H. Am. J. Orthopsychiat., **6**: 590, 1936.
19. Mitchell, A. Edinburgh Med. J., **11**: 639, 1866.
20. Murphy, G., Murphy, L., and Newcomb, T. Experimental Social Psychology. New York: Harper, 1937.
21. Myers, J. K., and Roberts, B. H. Sociol. and Socl. Res., **39**: 11, Sept. 1954.
22. Newell, H. W. Am. J. Orthopsychiat., **4**: 387, 1934.
23. Newell, H. W. Am. J. Orthopsychiat., **6**: 576, 1936.
24. Redlich, F. C., et al. Am. J. Psychiat., **109**: 729, 1953.
25. Roberts, B. H., and Myers, J. K., Am. J. Psychiat., **110**: 759, 1954.
26. Reichard, C. T., and Tillman, C. Psychiatry, **13**: 247, 1950.
27. Sears, Robert R. Am. Sociol. Rev., **15**: 397, 1950.
28. Tietze, Trude. Psychiatry, **12**: 55, 1949.

AN EVALUATION OF SUBCOMA INSULIN THERAPY [1, 2]

DONALD C. GREAVES, M.D.; PETER F. REGAN, III, M.D.; NEW YORK CITY; AND MAJOR LOUIS J. WEST, USAF (MC)

This presentation will review and evaluate subcoma insulin therapy as it has been administered at the Payne Whitney Psychiatric Clinic during the years 1942-52. Subcoma insulin therapy, which has received its widest application in the treatment of schizophrenic reactions, has been used here as an adjunct to psychotherapy. It seems especially important to clarify the status of subcoma insulin treatment, for many reports have suggested that insulin coma or "shock" is the treatment of choice in these reactions. Unfortunately, the numerous reports on the "modified" insulin treatments fail to give detailed criteria which will clearly define the depth of response, thereby making comparison difficult.

Furthermore, results of therapy have usually been analyzed in terms of the number of remissions and on short- or long-term follow-up studies. The ability of a patient to live outside of a hospital setting or to make an adequate adjustment in the social milieu to which he returns has been the determining factor. To the authors these studies seem inconclusive for the following reasons: insulin therapy is not a specific curative therapy for schizophrenic reactions. Furthermore, there are well-recognized factors which influence the prognosis of schizophrenic illnesses, and these factors are operative whether insulin is used or not. It would seem inconclusive to present results of treatment only on the basis of eventual outcome of the illness.

With this background, emphasis is here placed on the detailed description of subcoma insulin treatment, with due regard for the setting in which it was given and the selection of patients who received it. Indications and contraindications for the treatment are presented and the results of treatment are analyzed.

[1] Read at the 110th annual meeting of The American Psychiatric Association, St. Louis, Mo., May 3-7, 1954.

[2] From the Department of Psychiatry, Cornell University Medical College, and The New York Hospital, Payne Whitney Psychiatric Clinic.

INSULIN TREATMENT: COMA AND SUBCOMA

Most authors, in a wealth of literature, feel that there is a positive correlation between the depth of the insulin treatment and a favorable response. This has led to an almost universal advocation of the use of deep insulin shock or coma insulin treatment in schizophrenia. Coma is defined as the state of hypoglycemia in which there is no response to outside stimuli. It is usually reached during the fourth hour of hypoglycemia and after brief initial periods it is later extended to one hour or longer. With coma, a series of neurological signs appear in fairly constant progression, as described by Frostig(1), Himwich(2), Kalinowsky and Hoch(3).

As opposed to the accepted definition of coma, the concept of subcoma insulin therapy is not clear. At the Payne Whitney Psychiatric Clinic, the therapeutic level of subcoma insulin therapy is a deeply stuporous state, *i.e.*, the "precoma" phase of clouded consciousness. This state we define as that level in which the patient barely responds to only 1 or 2 strong noxious stimuli, and does not respond to any weak stimuli. In reviewing the literature, however, one finds such terms as "half-coma," "superficial coma," "light coma," "sopor," and "ambulatory insulin treatment"(4, 5, 6, 7, 8, 9). All these might correctly be termed "subcoma insulin therapy," yet they differ widely in dosage of insulin used, duration of hypoglycemia, signs used to indicate depth, mode of termination, and results of treatment. In order to avoid the confusion caused by nomenclature and by reliance on inconstant subjective, autonomic, motor, or so-called clinical phenomena, we have defined the effect of insulin in terms of the nature of the patient's response to stimuli. The state of responsiveness is determined by the application at 15-minute intervals of standardized stimuli in the auditory, visual, kinesthetic, light touch and deep-pressure modalities. These tests can be

performed easily by nurses caring for the patient; charting can be done rapidly, and the depth of the subcoma reaction demonstrated. The desired duration of the "precoma" phase of subcoma insulin is 45-60 minutes, and the total treatment duration is measured in terms of hours of effective treatment.

This level of subcoma insulin therapy was the level desired during the period covered by the present study. The objective tests were not then in use, however, and the determination of depth of treatment depended on the judgment of the physician in charge. For certain brief periods, therefore, milder reactions were produced. In general, however, treatment has been similar to that currently used(10). A usual course of subcoma insulin consisted of 50-60 effective treatments.

Treatments are given in 3-bed dormitories, 6 days a week. Insulin is injected at 7:30 a.m. and the treatment is terminated by 11:30 a.m., using gavage or intravenous glucose if the patient cannot drink. Beginning with small doses of insulin, the dosage is increased slowly depending upon the nature of the patient's responses. The final effective dose ranges between 20 and 200 units, with an average between 100 and 150 units. Close observation is maintained throughout the treatment period.

The progression of clinical response is characteristic. As the first symptoms of hypoglycemia appear, patients display lassitude, somnolence, perspiration, salivation, hunger, thirst, and hypotonia. Within 2 or 2½ hours, clouding of consciousness becomes apparent and the patient shows thinking difficulty, impaired alertness, and confusion. There are perceptual distortions and increasingly inadequate responses to stimuli. As clouded consciousness deepens, speech becomes slurred and somnolence more profound. Motor manifestations vary from mild twitching to wild thrashing. Grand mal convulsions may occur early or late in the treatment. With progressive impairment of cortical function, patients exhibit apraxia, agnosia, aphasia, distortion of sense of time and space, and loss of speech. There is progressively less strength of response to strong stimuli. Finally, in the precoma phase, the patient gives only a minimal, inadequate response to strong noxious stimuli. Insulin dosage is adjusted to maintain this state for 45-60 minutes. The fixed loss of all response indicates that coma has been reached, and the treatment is terminated for that day. Other indications for interruption of treatment are marked deviation of pulse or blood pressure, gross respiratory difficulties and grand mal seizures. Where convulsions recur frequently, they may be controlled with moderate doses of phenobarbital.

SETTING OF TREATMENT AND SELECTION OF CASES

The Payne Whitney Psychiatric Clinic is a 108-bed unit of a general hospital. Patients are screened and selected from voluntary applicants, and at any given time include a wide variety of psychiatric and psychosomatic disorders. A broad cultural and socio-economic spectrum is encompassed and patients vary in age from adolescence to senility. Readmissions are rare, and chronic cases are seldom accepted. Psychotherapy is the primary technique and physical forms of treatment are considered adjunctive. Patients considered most suitable for subcoma insulin treatment were those having psychopathologic states accompanied by severe anxiety. Schizophrenic excitements and panic reactions were most frequently selected. Manic excitements and depressions were considered only when anxiety was a prominent feature. Psychoneurotic reactions were treated when cachexia or debilitation was present, or where a thinking difficulty, related to anxiety, made psychotherapeutic investigation ineffectual. In all instances the insulin was employed to facilitate exploratory psychotherapy.

A certain number of cases received both insulin and electroconvulsive treatments during their hospital residence. Since certain authors advocate the combined use of insulin and electroconvulsive therapy in the schizophrenic patients, it should be emphasized that those patients under study, with very few exceptions, have received only one form of treatment during a single period. Insulin and electroconvulsive treatments have not been administered on the same day. In the schizophrenic group, most patients who received electroconvulsive treatment had failed to re-

spond to insulin alone, or were cases of chronic excitements that responded inadequately to other forms of therapy.

RESULTS

During the decade 1942-52, 2,460 patients were admitted to the inpatient division of the clinic. Two hundred twelve (8.6%) received subcoma insulin therapy. The results of treatment in 159 patients with schizophrenic or affective illness are shown in Table 1. This group comprises all the patients with these illnesses on whom detailed records were available. Improvement was estimated on the basis of the patient's state at the initiation and completion of treatment, utilizing individual psychopathologic examinations, studies of behavior, group adjustment, and dynamic progress and understanding. Those patients were considered improved who showed subjective relief of distressing symptoms, decreased thinking and concentration impairment, and less disturbed behavior. From Table 1, it can be seen that there was definite improvement, permanent or temporary, in 79.2% of the schizophrenic group and 76.9% of the affective group.

Of the patients treated with subcoma insulin therapy, 133 were schizophrenic. This represents only about ⅓ of the total number of schizophrenic patients (446) who were admitted during this 10-year period. The analysis of improvement of insulin-treated schizophrenic patients by diagnostic subcategory in Table 2 shows that 82.8% of the paranoid type improved, 79.0% of the catatonic type improved, and 73.0% of the remaining types improved.

Within the schizophrenic subgroups, a wide variation in response was found. Thus in the paranoid group (Table 3), illnesses characterized by acute or subacute disturbances with marked fear, incoherence, elation, or depression had improvement rates ranging from 88.2% to 95.0%, while those with a gradually developing disturbance had a rate of 61.1%.

In the catatonic group (Table 4) excitements with severe anxiety had a 100% improvement rate, as compared with 42.8% in the excitements where anger was the outstanding affective component. In stupors associated with fear or depression there was an 83.3% improvement.

In the simple, hebephrenic, and mixed schizophrenic reaction (Table 5), improvement ranged from 81.2% to 100% if marked anxiety and fear were present.

In contrast to the schizophrenic cases, patients with affective illnesses (Table 6) did not do better when severe anxiety and fear were present. The predominance of these

TABLE 1

PER CENT IMPROVEMENT AT TERMINATION OF SUBCOMA INSULIN TREATMENT

(Diagnostic Groups—1942-1952)

Diagnostic group	Number	Per cent improved
1. Schizophrenic reactions	133	79.7
2. Affective illnesses	26	76.9
Total treated patients	159	

TABLE 2

PER CENT IMPROVEMENT AT TERMINATION OF SUBCOMA INSULIN TREATMENT

(Schizophrenic Subgroups—1942-1952)

	Number of cases	Number improved	Per cent improved
Paranoid schizophrenic reactions	64	53	82.8
Catatonic schizophrenic reactions	43	34	79.0
Other schizophrenic reactions	26	19	73.0
Total	133	106	79.7

TABLE 3

PER CENT IMPROVEMENT AT TERMINATION OF SUBCOMA INSULIN TREATMENT

(Paranoid Schizophrenic Reactions—1942-1952)

	Number of cases	Number improved	Per cent improved
Gradual delusional formation	18	11	61.1
Acute disturbance with delusions and			
1. Incoherence	9	8	88.8
2. Fear and depression.	20	19	95.0
Acute or subacute disturbance with delusions and marked elation or depression	17	15	88.2
Total	64	53	82.8

TABLE 4

PER CENT IMPROVEMENT AT TERMINATION OF SUBCOMA INSULIN TREATMENT

(Catatonic Schizophrenic Reactions—1942-1952)

	Number of cases	Number improved	Per cent improved
Catatonic excitment			
a. Marked depression or elation	7	6	85.7
b. Anger outstanding	7	3	42.8
c. Fear and severe anxiety	12	12	100.0
d. No primary affective component	1	0	0.0
Catatonic Stupor			
a. Marked fear or depression	12	10	83.3
Mixed catatonic picture	4	3	75.0
Total	43	34	79.0

TABLE 5

PER CENT IMPROVEMENT AT TERMINATION OF SUBCOMA INSULIN TREATMENT

(Simple, Hebephrenic, Mixed Schizophrenic Reactions—1942-1952)

	Number of cases	Number improved	Per cent improved
Elation or depression present but not leading	8	4	50.0
Anxiety or fear present but not leading	16	13	81.2
Episode of severe anxiety and fear	2	2	100.0
Total	26	19	73.0

TABLE 6

PER CENT IMPROVEMENT AT TERMINATION OF SUBCOMA INSULIN TREATMENT

(Affective Illnesses—1942-1952)

	Number of cases	Number improved	Per cent improved
Manic excitements			
a. Fear and severe anxiety	3	2	66.6
b. Elation with anger	2	2	100.0
c. Sexual excitement	4	4	100.0
Depressive illnesses			
a. Fear and severe anxiety	11	6	54.5
b. Marked resentment.	2	2	100.0 *
c. Panic phase	4	4	100.0
Total	26	20	76.9

* Mild improvement.

emotions was associated with an improvement rate of 54.5% in depressed patients, and 66.6% in excited patients. Patients with elation and anger, sexual excitement, resentment and panic, however, all responded well.

It is interesting to note that the degree of improvement at the termination of insulin treatment did not necessarily correlate with the over-all course of the illness. Instead, the treatment had been directed at improvement of a phase of the illness, and results reflect its effect on such a phase. Thus, among the improved group, 13.8% had relapsed by the time of discharge from the hospital weeks or months later. Similarly, 22.2% of the unimproved group were substantially improved at the time of discharge.

An analysis of general information about the insulin-treated schizophrenic patients shows that the improved group had a higher number of acute illnesses that were of shorter duration than the unimproved group.

DISCUSSION

The primary consideration in this review has been the effectiveness of subcoma insulin as a symptomatic relief and adjunct to psychotherapy; through the years its use has been determined by psychopathology and not by diagnosis. In considering the data presented, therefore, it should be kept in mind that the figures are not directly comparable to published results of the use of coma insulin therapy(11). The most valid comparison can be made in considering the treatment of the group of schizophrenic patients. In this group of 133 patients, 79.2% received moderate to marked relief of distressing symptoms. In most patients, the most dramatic relief was from anxiety with its attendant concentration difficulties, perplexity, confusion, and bewilderment. With such relief, patients were better able to adjust to the social requirements of the hospital and to proceed with dynamic psychotherapy in an effort to modify the basic underlying illness. It is interesting to note that insulin treatment did not seem to act so affectively in relieving the anxiety associated with manic or depressive illnesses.

In contradistinction to the immediate change produced by insulin treatment, many factors in addition to the immediate

psychopathologic picture played a role in the eventual outcome. Those patients with previously stable personality, having an illness of relatively short duration and acute onset, responded best to psychotherapy and had the most favorable eventual outcome. Conversely, patients with insidiously developing illnesses of long duration or with unstable pre-illness personality, responded less well to psychotherapy. In this light, the percentage improvement rate at the time of discharge is inconclusive in terms of the efficacy of subcoma insulin treatment. It is felt that presentation of the immediate results of treatment, as done here, is important. Results are analyzed in terms of actual psychopathologic change rather than in terms of the psychopathologic, social, and cultural factors which determine the eventual "ability" of the patient to live outside of a hospital setting. In brief, insulin therapy, whether coma or subcoma, is not a specific therapy for schizophrenic or affective illnesses, but a useful symptomatic treatment; its effectiveness must be gauged by the degree to which it achieves symptomatic relief and not on the course of the illness alone.

Summary

In contrast with the accepted definition and efficacy of coma insulin therapy, the status of subcoma therapy is still not clear. From 1942 to 1952, subcoma insulin therapy at the Payne Whitney Psychiatric Clinic was considered to be that which produced a hypoglycemia sufficient to cause clouded consciousness lasting 45-60 minutes, but stopping short of coma. It has been used in the treatment of 212 patients during this period. There was improvement in 79.7% of 133 schizophrenic patients, and in 76.9% of 26 patients with affective illnesses. It appears that, in the treatment of certain psychopathologic reactions which occur in schizophrenic and less frequently in manic and depressed patients, subcoma insulin is a useful form of therapy. The psychopathologic reactions which are affected favorably by this treatment are catatonic excitements with marked fear, depression, or elation; acute paranoid reactions with fear, incoherence, elation, or depression; schizophrenic episodes of excessive anxiety; manic excitements with marked anger or sexual excitement; and panic phases in depressive illnesses. Catatonic stupors with marked fear reacted favorably. It should be emphasized that, while many distressing symptoms can be controlled or relieved by insulin, the underlying illness is not necessarily altered.

BIBLIOGRAPHY

1. Frostig, J. P. Am. J. Psychiat., 96: 1167, Mar. 1940.

2. Himwich, H. E. Brain Metabolism and Cerebral Disorders. Baltimore: Williams and Wilkins, 1951.

3. Kalinowsky, L. B., and Hoch, P. N. Shock Treatments, Psychosurgery, and Other Somatic Treatments in Psychiatry, 2d ed. New York: Grune & Stratton, 1952.

4. Von Braumuhl, A. Insulinshock und Heilkrampf in der Psychiatrie. Stuttgart: Wissenschaftliche Verlagsgesellschaft, 1947.

5. Sargant, W., and Slater, E. An Introduction to Physical Methods of Treatment in Psychiatry, 2d ed. Baltimore: Williams and Wilkins, 1948.

6. Kuppers, E. Dtsch. med. Wschr., 63: 377, p. 31 (1937).

7. Polatin, P., Spotnitz, H., and Wiesel, B. N. Y. State J. Med., 40: 843, 1940.

8. Bennett, C. R., and Miller, T. E. Am. J. Psychiat., 96: 961, 1940.

9. Tomlinson, P. J. Psychiat. Quart., 22: 609, 1948.

10. Rennie, T. A. C. Arch. Neurol. & Psychiat., 50: 697, Dec. 1943.

11. David, Henry P. Am. J. Psychiat. 110, 774, Apr. 1954.

VAGOTOMY—FIVE YEARS LATER [1, 2]

WILLIAM M. SHANAHAN, M.D.,[3] DENVER, COLO.

This is a report of findings, 4 to 5 years, 7 months (average 5 years) later, on the first 25 Chicago area patients completely vagotomized by Dr. Lester Dragstedt and his staff at the University of Chicago. Emphasis was put on finding and personally interviewing every patient concerned. We were successful in 20 instances. Four individuals refused to be seen and 1 is dead. We were, however, able to secure considerable information concerning these latter 5 patients—data concerning sex, age, marital status, ulcer history, physical result of vagotomy, over-all functional result of vagotomy on each patient, personal history, other psychosomatic conditions, previous psychiatric morbidity, subsequent psychiatric morbidity, ulcer in family, and present complaints. The findings seem to justify some new conclusions and speculations.

MATERIAL

All 25 patients studied were white; 3 were women and 22 men. The ages at operation ranged from 31 to 64. Eighteen were married, 5 were single, 1 was separated, and 1 a widow. Thorough studies were conducted preoperatively; both transthoracic and abdominal approaches were employed surgically. All cases were checked with insulin tests before discharge and found negative. Tests 2 years later were positive on one patient, implying some vagal intactness and probably explaining the recurrence of ulcer with gastrectomy elsewhere.

At the time of surgery ulcer symptoms had been intermittently present from 6 to 20 years, (average 15 years). In 4 instances there was probable ulcer in siblings. Nine of these 25 patients were first or only children, while 4 were the youngest in the family.

PHYSICAL ULCER RESULTS

Dr. Dragstedt and staff have followed these cases physically and roentgenologically after surgery and before leaving the hospital and also at intervals since discharge. In accordance with the dictum that with complete vagotomy no ulcer is possible, none was found. In the 1 case mentioned above, vagal function returned and further surgery followed.

FUNCTIONAL RESULTS

One does not go far with personal follow-up of vagotomy cases before he is struck by marked differences in attitudes and feelings of different patients concerning the operation, the physicians involved, and the hospital. In 16 cases (64%) we were warmly received and easily able to arrange appointments at the hospital. These proved to be grateful, enthusiastic patients who continue free of their disability and now are as productive or more so than they have been in many years.

All these patients were men. They were characteristically conscientious, hard working, ambitious, and moderately or very successful. Several had taken major family responsibility in their teens when the father died or had become ill. First ulcer symptoms often appeared following the death of the mother or the birth of their first or second child. Seven (44%) of the 16 patients had had, before vagotomy, other psychosomatic illness which had not notably changed since. These conditions included migraine, asthma, diabetes, impotence, and chronic backache. The group presented no outstanding history of previous psychiatric disorder. One man had occasional 3-day depressions plus a tic in one eyelid, another was explosive and unstable under pressure; a third had, earlier in his life, used alcohol to excess for about 5

[1] Read at the 110th annual meeting of The American Psychiatric Association, St. Louis, Mo., May 3-7, 1954.

[2] The author is indebted to Dr. Henry Brosin for suggestions and encouragemnt in this study. He also wishes to acknowledge the consideration and cooperation of Dr. Lester Dragstedt and his staff in making available to him the clinical material for this study.

[3] Now associate clinical professor of psychiatry at the University of Colorado Medical School, Denver. The work reported here was done while the author was assistant professor of psychiatry, University of Chicago Medical School.

years. Three of the 16 had never married but the others gave no history of divorce. Over and over they told of long years of intermittent pain, preoperatively, partial disability, financial and physical worries, dietary and social limitation. With active ulcer they continued work but were acutely aware of decreased capacity and were very sensitive about it. Impatience, irritability, quick temper, and seclusiveness were common. After surgery they felt a new security and vigor and became patient, pleasant, and optimistic. Not one of these 16 men has developed any new psychiatric morbidity since surgery—*i.e.*, clinical neurosis, psychosis, psychosomatic or character disorder, including alcoholism and addiction.

One man, heavily alcoholic for years before surgery, is reported to have stopped drinking and to have done well in every way until he died of a cardiac condition almost 4 years later.

Eight patients (32%) presented a very different picture. Four, 2 men and 2 women, were so dissatisfied with vagotomy that they refused to be seen at all, even on home visit at their convenience. They openly expressed considerable hostility and resentment toward the hospital and physicians. One was the patient whose vagal function returned. After surgery elsewhere he is functioning well. The other man was a drug addict before surgery and has since developed mucous colitis. He is doing some work but is a very unhappy, hostile individual who continues on opiates. So far as we could learn he is not troubled with peptic ulcer. This case raises the question of the relationship between intaking and discharging vectors in the psychic economy. It is possible that since the patient is now deprived of the dependency gratifications incident to having ulcer the colitis now compensates for, or justifies his unconscious dependency wishes. In spite of this, these wishes are not being gratified and this contributes to his present hostile and embittered state.

Both women were housewives who were forced to go to work by the death of the husband in one case, and the gross irresponsibility of the husband in the other. Shortly after this they developed ulcer. One is now a sem-invalid with asthma and hypochondria and the other is a semi-invalid with "weakness and heart trouble."

Of the 4 with unsatisfactory results, only one is working and he credits his limited capacity to surgery performed elsewhere following vagotomy. He has alimentary glycosuria, high ambitions, moderate capacities, and is not very successful. Of the other 3, one is a man of 60 who has had pensionitis since his 'teens and although free of ulcer now has a variety of hypochondriacal complaints. Another is a man who was 64 at the time of his surgery and had then been incapacitated and dependent on a single son for 2 years. He has become severely hypochondriacal since surgery and has not returned to work. He has apparently been failing physically because of age and generalized arteriosclerosis since before surgery. The third is a woman who is well so long as she does not return to business activities, at which time abdominal symptoms return.

Of the 8 functionally unsatisfactory cases, 6 persons had psychosomatic disorder before surgery, including neurodermititis, functional bowel distress, asthma, arthritis, and colitis. These conditions are not worse at present.

Discussion

A thorough discussion of the underlying psychopathology and psychodynamics in peptic ulcer patients is to be found in Alexander's book(1). We shall not review this material here but, shall, in the discussion to follow, build upon it in considering the implications of the functional results in the patients reported.

Consideration of the character traits, history, living circumstances, and reaction to ulcer symptoms in the individuals who achieved a functional as well as an anatomical result from vagotomy shows that these persons have much in common. A similar consideration of those who got an anatomical result but not a functional one shows that these patients also have much in common. The functionally successful individuals were all males, while 3 of 7 unsuccessful functionally were females whose circumstances forced them to be self-supporting but whose inclinations were definitely otherwise.

The man who will get a satisfactory functional result from vagotomy is one who

shows long-standing successful reaction formation against his dependency, with a history of many years of steady, conscientious, fairly successful work. He usually has a stable marriage with a sympathetic, supportive wife who indulges him a great deal. He is severely threatened by active ulcer but continues to work. He is aware of limitation and resents this. He is not comfortable when he is put to bed or hospitalized, but is restless and in a hurry to return to work.

The individual who will have a poor functional result is a woman, who got along fairly well until circumstances forced her to become self-supporting or to support her children, and who then developed an ulcer and is still faced by the same economic necessities; or a man who has openly accepted his dependent inclinations throughout the years, has had them fairly well satisfied preceding ulcer, and who is now in a situation where they will not be satisfied unless he is sick. Insofar as this man has worked and carried responsibility, he has done so grudgingly with a feeling of being imposed upon. Even in periods of good physical health he is sour, irascible, and complaining. A variation on this is the man who has achieved successful dependency by long-standing hypochondriasis, semi-invalidism, other psychosomatic disorder, or a combination thereof. These individuals with a poor prognosis usually stop work when they have ulcer symptoms, calmly accept hospitalization and nursing care and, if they have any complaints, feel that not enough is being done for them.

Szasz(3) has reported that good total prognosis is related to minimal investment of psychic energy in the organic illness and therapy and, visa versa, poor prognosis goes with large investment. It is likely that the more acceptable the dependent wishes are consciously, the more a patient will invest energy in the illness of ulcer and react with resentment when vagotomy is anatomically successful. In those who accept dependency, ulcer, and probably any incapacitating illness, offer socially acceptable gratifications. The person with reaction formation against receiving is thwarted and frustrated by physical illness.

In 1947, Kapp *et al.*(2) separated peptic ulcer patients into 2 groups coinciding with those above. Among our patients who achieved successful functional results we found men who had very militantly protective wives who insisted on knowing exactly what we wanted of the husband, who made arrangements for us to see him, who came along with him when he was interviewed, and who had to be present during the interview to be sure that we were not going to hurt him with needles, stomach tubes, or in any other way. One of these men was a husky bartender and bouncer; another was a tough chief of a private police force; but neither offered any objection whatsoever to his wife's solicitude. In other words, there are some men who at home accept considerable mothering and dependence. These individuals could be placed in a third group called "simultaneously independent-dependent" along with the 2 groups listed by Kapp.

This division is somewhat arbitrary because the individual with even extreme reaction formation usually has some secret dependent gratifications. The important emphasis in evaluation should be on his attitude toward being taken care of as revealed in both expression and behavior.

There has been some speculation as to the probable occurrence of new symptoms of emotional decompensation in patients successfully vagotomized. This implies that the presence of ulcer with consequent dietary, hospital, and nursing care might give these patients some emotional satisfaction. Our experience with those with successful reaction formation would indicate that dietary restriction, inactivity through bedrest and hospitalization increases the internal conflict of these patients because it interferes with the pattern of life and activities possible when they are well and in a fairly successful neurotic equilibrium. Under these circumstances, these patients show considerable evidence of frustration, namely, tension, anxiety, restlessness, sleeplessness, irritability, quick temper, sensitivity about reduced productivity and urgency to get back into action. When the conditions frustrating the reaction formation are removed by vagotomy these patients get a new lease on life and frequently achieve a far healthier, more stable, and happier adjustment than they had in the

many years they were intermittantly troubled by ulcer. It seems to us reasonable, therefore, to regard some of the traits which have been attributed to the personality of patients with peptic ulcer as pathoneurotic reaction symptoms to the frustration of reaction formation against dependency rather than as inherent in the character of these individuals.

Insofar as the passage of neural impulses down the vagus nerves may be of any homeostatic value in peptic ulcer patients, the procedure of vagotomy does not interfere but only prevents the impulses from reaching the end organ. The results in the cases we have studied would indicate that the participation of the end organ in this process is not necessary for the vagal discharges to fulfill whatever function they have in the central conflict. One could not infer that separation of the end organ in any way mitigates the central conflict, but it would appear that in those with successful reaction formation, separation of the end organ permits the establishment of a more successful neurotic equilibrium.

In ulcer patients who do not have successful reaction formation, vagotomy and the relief of ulcer disability does not free them to better serve impulses to achieve but instead confronts them with the necessity of finding some other claim or disability to better secure gratification. In this light the hostility and bitterness which they show toward anatomically successful vagotomy is understandable.

Summary

On an average of 5 years after complete vagotomy, 24 of 25 peptic ulcer patients had no physical recurrence; 6, or 64%, of all men, achieved an excellent functional result with improved vigor, amiability, and total adjustment. No new psychiatric morbidity of any type has appeared in these patients.

Eight, or 32%, 3 of whom were women, while anatomically cured, are dissatisfied with vagotomy, maladjusted, and incapacitated by hypochondriasis, other psychosomatic disorder, or working under duress.

Study indicates that the patient who will probably get a good functional result from vagotomy can be psychiatrically identified prior to surgery. Suggested criteria for the identification of those who may get a poor functional result are also presented. This does not mean that these cases should not be operated upon if the accomplishment of an anatomical result is deemed of sufficient importance.

In addition to the individuals who accept their dependency and those who present reaction formation, there would appear to be a third group, namely, those who are independent at work and dependent at home.

In peptic ulcer patients with satisfactory reaction formation, it seems that some characteristics previously considered a part of the patient's personality are really pathoneurotic reactions to frustration of neurotic equilibrium and that they will vanish with successful vagotomy.

Intensive study of individual cases of functional success and failure after vagotomy will amplify our understanding of the psychodynamics involved and improve our ability to assist the surgeon in selecting cases.

BIBLIOGRAPHY

1. Alexander, Franz. Psychosomatic Medicine. New York: Norton, 1950.

2. Kapp, F. T., Rosenbaum, M., and Romano, J. Am. J. Psychiat., **103**: 700, 1947.

3. Szasz, Thomas S. Psychsomat. Med., **9**: 331, 1947. *See also*: J. Nerv. Ment. Dis., **115**: 394, 1952; Arch. Neurol. & Psychiat., **62**: 728, 1949.

CASE REPORT

CUSHING'S SYNDROME AND ITS MANAGEMENT [1]

PHILIP E. HERTZ, M.D., ENDRE NADAS, M.D., AND HENRY WOJTKOWSKI, M.D.
LYONS, N. J.

Recent medical publications contain an ever increasing number of reports describing the treatment of Cushing's Syndrome by subtotal and total adrenalectomy. Reference is made particularly to articles by Sprague and associates(1), and by Abbott et al.(2). The present note reports a young man, whose clinical picture was dominated by a severe psychosis, which delayed appropriate surgical treatment for many months. However, despite the long delay, this case was brought to a successful therapeutic conclusion.

This 23-year-old soldier entered the VA Hospital, Lyons, New Jersey, by transfer from Japan from an army station hospital, on November 5, 1952, with the diagnosis of (1) schizophrenic reaction, paranoid type, (2) essential hypertension and (3) keratosis pilaris. According to the history, in May of 1952, this young man, with a hitherto fine service record, became suddenly confused. He broke into the guardhouse of his station with the expressed purpose of grabbing a carbine and shooting himself. When hospitalized he continued to be wild, chewing the plaster off the walls of his room, cutting his forearm with a broken bottle, evincing hallucinations of an auditory nature, and expressing delusions of a grandiose, religious type. Diagnosed as schizophrenic, paranoid type, he was given 26 electroconvulsive treatments to reduce his excitement. He remained unimproved and was in much the same state when he arrived at Lyons.

Upon admission there, he was found to be an extremely agitated, confused, obese young man, with a full-moon face, short sparse hair and an extensive generalized acne. There were noted an increased cervico-dorsal pad (buffalo hump) and multiple blue striae on the upper thighs and lower abdomen. His blood pressure fluctuated between 140 to 150 mm. hg. systolic and 90 to 100 mm. hg. diastolic. The laboratory studies revealed: a glucose tolerance test with a diabetic-type curve; 24-hour urine showed a normal 17-ketosteroids level of 9 mm. and an elevated 11-oxycorticosteroids level of 8.5 mm. All other laboratory findings were within normal limits. These included a complete blood count, hemoglobin, blood calcium, sodium and potassium studies, P.S.P. excretion, urea clearance, and urine concentration tests. The circulating eosinophils ranged from 64 to 263 per cu. mm. Roentgenograms of the chest, long bones, and other vertebrae showed no osteoporosis. The D-7 and the D-12 vertebrae revealed mild compression fractures, which were attributed to previous electroconvulsive therapy. The appearance of the skull on x-ray was normal, so were the intravenous pyelogram and the outline of the adrenals visualized by presacral insufflation of air. On the basis of the above findings, a diagnosis of Cushing's Syndrome was made.

During the ensuing months, the patient remained obese, his acne resisted topical treatment, and his hair continued to be sparse, short, and brittle. The blood pressure was usually around 150 systolic and 90 diastolic. His behavior was characterized by confusion, marked overactivity and emotional instability. He was given a number of electroshock treatments on a maintenance basis which reduced his activity, although the beneficial effect derived from this treatment was of brief duration. Inasmuch as there was no clear-cut evidence of the existence of an adrenal gland tumor, it was decided to try irradiation of the pituitary, and for this treatment he was transferred to the VAH, Bronx, N. Y., in October 1953. Here he received 1,500 *r* and when this dose produced no appreciable change, an additional 3,000 *r* were administered to the pituitary, between April and May of 1954. At the termination of the latter course of roentgenotherapy, he was returned to Lyons.

In evaluating his condition, we noted that he had become more obese; however, his acne improved and there was moderate new growth of hair on the scalp, except for the areas of alopecia at the site of the irradiation. As for his mental state, he evidenced transitory periods relatively free from psychotic manifestations. At this time, there was noted a slight cardiac enlargement on x-ray examination of the chest.

When returned to the VAH in the Bronx for further evaluation and treatment, it was decided to perform an adrenalectomy. After a preoperative medication of 5 mgms. desoxycorticosterone, intramuscularly for 2 days, a right adrenalectomy was performed on September 27, 1954. The resected right adrenal gland weighed 13 gms. (weight of normal adrenal gland is 6 gms.) and microscopically showed cortical hyperplasia. After a preoperative medication of hydrocortone 20 mgms. every 8 hours for 5 days and desoxycorticosterone daily for 4 days, a left adrenalectomy was performed on October 19,

[1] Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the authors.

1954. The left adrenal gland weighed 24 gms. and microscopically showed marked cortical hyperplasia. On a medication of hydrocortone, 15 mgms. every 6 hours, the patient had an uneventful postoperative course. His blood pressure remained around 110/70 and his pulse ranged between 80 and 100. In the subsequent 4 weeks, his medication was stabilized at hydrocortone, 10 mgms. b.i.d. and sodium chloride, 2 gms. t.i.d., on which regimen he was able to leave his bed, ambulate, and eat a regular diet without showing signs of adrenal insufficiency.

Following the first adrenalectomy and consistently thereafter, he showed a steady and gradual improvement of his mental condition. By December of 1954, he was placed on an open ward with full privileges of the grounds. He was no longer depressed and had gained a hopeful attitude with a fair amount of insight into his past illness and his current condition. A psychological test on February 1, 1955, found him to be functioning at a normal range of intelligence. On February 9, 1955, he was allowed to visit his family for 3 weeks. While at home, he was taking cortisone, 20 mgms. b.i.d., and sodium chloride, 2 gms. t.i.d. When he returned to the hospital at the end of his leave, he had lost 5 pounds and evinced further marked improvement in his general appearance. Comparisons made between his appearance at this time and a picture taken prior to the onset of his illness in 1952, as compared with photographs taken at the height of his illness, graphically demonstrated his return to normal. The acne had disappeared; his hair was thick and of fine consistency; his face became naturally thin and the buffalo hump disappeared from the cervicodorsal region. The blood pressure remained about 108/68 and subjectively the patient indicated a gradual return of strength and desire to resume his former civilian occupation, as a bricklayer. At the time of this writing, he has been discharged from the hospital with a recommendation for a choice of occupation more compatible with his physical status and for continued periodic aftercare to be rendered in the outpatient department of the VA Hospital in Bronx, N. Y.

Summary

1. A case of Cushing's Syndrome in a 23-year old male is presented.

2. Proper diagnosis was delayed by an overwhelming psychotic picture, resembling schizophrenia.

3. Initial treatment consisting of a 2-stage roentgen irradiation of the pituitary region was rendered, producing no significant mental improvement.

4. Final treatment consisting of complete adrenalectomy, performed in 2 stages and followed by replacement therapy, resulted in complete remission of all physical and mental symptoms and signs within 6 months, following the first stage of adrenalectomy.

BIBLIOGRAPHY

1. Sprague, R. G., et al. J.A.M.A., 151: 629, Feb. 21, 1953.

2. Abbott, W. E., et al. J.A.M.A., 156: 1168, Nov. 20, 1954.

HISTORICAL NOTE

AUGUST HOMBURGER: PIONEER IN CHILD PSYCHIATRY

June 29, 1955, marked the twenty-fifth anniversary of the death of August Homburger, one of the outstanding pioneers in the field of child psychiatry, a man who was among the first to grasp its organic, psychodynamic, psychosomatic, social, and educational implications. It is strangely pathetic that not even his name is known to the vast majority of present-day specialists. Many of us, it seems, have grown into the habit of acting as though our knowledge and orientation have no roots in the past. I know of no other scientific discipline in which there is so little respect for historical perspective. There is a feeling that all we need is to know and teach "the latest," which somehow has sprung up in our midst, much as Minerva was believed to have sprung from the head of Jupiter. A recent survey has disclosed the rather startling fact that the contributions and even the names of most of the psychiatric "giants" of the late nineteenth and early twentieth centuries do not exist in the awareness of the present generation of psychiatrists. This has a corollary which does not bode too well for the future: The young men are apt to emerge from their training with the impression that we, their teachers, who have suddenly seen the light, have given them the last word in formulation and methodology and that all there is left for them to do is to apply, exemplify, and elaborate. This makes for a kind of echolalia with little room for originality, inventiveness, and experimentation. Some of us, who in our teaching emphasize the dynamics of individual growth with justified conviction, do not concede to our specialty the right to further dynamic evolution.

It is, under the circumstances, refreshing to honor the memory of a man who came into the field at a relatively early time "with clean hands," without bias, and with the sole determination to study the behavior of children, the centrifugal and centripetal forces which shape personality, and the most effective clinical means of treating children.

Homburger had a phenomenal knowledge. A native of Frankfurt am Main, he began his medical career as a neurophysiologist and neuropathologist. His first publication was a monograph on psychoses and psychoneuroses associated with exophthalmic goiter. He became *Privatdozent* at the University of Heidelberg in 1912, on the basis of a book on the careers of psychotic criminals, which showed a remarkable understanding of the complexities of human conduct. This is especially noteworthy because Homburger's work before then was limited exclusively to organic factors. He had reported studies on the Babinski reflex, the innervation of the urinary bladder, cerebral arteriosclerosis, cerebellar tumors, the structure of the neuroglia, luetic meningo-myelitis, the effect of hypnotic drugs, and the durability of Weigert's stain.

In 1917, during the first World War, having given special attention to the somatic manifestations of soldiers' "hysterical" reactions, he was commissioned by his chief, Franz Nissl, to establish a psychiatric outpatient department at the University of Heidelberg. Homburger, who was made associate professor of psychiatry, began to limit his interest more and more to the psychopathology of childhood. It is almost unbelievable how much creative work and how much organizational activity he was able to pack into the 13 years between the time when he became interested in child psychiatry and the time of his death at 57 years of age. Mayer-Gross, in his moving obituary, pointed out how much courage it must have taken to introduce, as Homburger did, a series of university lectures on psychotherapy "at a time when neither official psychiatry nor official internal medicine paid the slightest attention to the significance and effects of psychogenic factors." It is nowadays not easy to understand how much determination it must have required to step out of the monastic seclusion of the psychiatric department of a medical school and to get the community at large to

participate in the concerns for mental hygiene. Homburger somehow found the time and was persuasive enough to be invited to act as a psychiatric consultant to the juvenile court. He worked in close collaboration with the social agencies and helped to shape a child-centered orientation of social workers. Though Aichhorn's work with "wayward" adolescents has become deservedly well known, very few people realize that Homburger organized near Heidelberg a residential school for neglected and delinquent children. Those who knew him have told me that Homburger could accomplish things which few others could bring about, because of a rare combination of unswerving purposiveness with good-humored mellowness. I have it from the late Dr. Gustav Aschaffenburg that, when he walked along the streets, there were few people who did not know him and greet him cordially and few children whom he could not address by their names and to whom he did not stop to say a few words.

In 1926, nine years after the opening of the psychiatric outpatient services, Homburger published his monumental textbook of psychopathology of childhood. To appreciate fully the wide scope, the humane spirit, and the dynamic aspects of this work, it seems appropriate to discuss briefly two other texts, by deSanctis and Ziehen, which had appeared just one year before Homburger's book.

Neuropsichiatria infantile by Sante deSanctis, the originator of the concept of dementia praecocissima, dealt with the pathology and diagnosis of conditions pertaining to the "neuropsychiatry" of childhood. The author scorned the modern direction toward "clinical individualism." He complained that "the investigation of intimate psychodynamics distracts the view of others from the inevitable play of its nervous or, more generally, vital partner." He went to the other extreme of losing sight of personality because of his strict adherence to somatic and localizing preoccupations.

Ziehen offered an excellent summary and an exhaustive bibliography of all that had been described as psychopathologic manifestation in children. According to Ziehen, an abnormally behaved child either had a certain mental disease or was endowed with a certain psychopathic constitution. The symptoms of each condition were carefully recorded. However, their mode of onset and development, the personalities of the patients, and environmental and attitudinal factors were left untouched. On the whole, the book was an almost literal translation of a cataloging, nosographic adult psychiatry into terms of how much of it one might find in children.

Homburger's pluralistic orientation could not abide by the therapeutically sterile and etiologically one-sided categorizing of Ziehen and deSanctis. His background had given him a mastery of neurology, which served admirably in his work with children but at the same time made him fully aware of the fact that cerebral anomalies alone could not account for social, attitudinal and other factors in his patients' experiences. In the 49 chapters of his book, he discussed psychologic, psychiatric, and educational theories and insights at considerable length. With a critical eye and with remarkable fairness, he acquainted his readers with association psychology, gestalt psychology, characterology, Kretschmer's types of body configuration, Adler's organ inferiority, Freud's theory of infantile sexuality, and Jung's ideas of the father's significance in the destiny of the individual. The book, being an elaboration of lectures given at the university, was written charmingly and clearly and leaves one with the impression not only of professional competence but also of warm sympathy and great human understanding.

His clear thinking was matched by his capacity for what one may regard as truly prophetic vision. He foresaw his own role as a pacemaker. He wrote, in the introduction to his book:

> The psychopathology of childhood will—of this I am firmly convinced—experience much deepening and enrichment in the years to come. Whatever I may have to say in these chapters, bears the nature of transitoriness and is still anchored in tradition.

Yet he was not by far as transitory or traditional as he modestly assumed. For one thing, he was one of the first child psychiatrists who insisted on the benefits of interdisciplinary collaboration. He not only worked in close contact with psychologists

and social workers but he also was an untiring supporter of the *Heilpädogogik* movement which, begun by educators in the nineteenth century, may well be regarded as a precursor of modern orthopsychiatry. It is not generally known in this country that *Heilpädogogik*, which started with an emphasis on the special education of retarded and deaf-mute children, broadened its scope gradually to include all problems of development and behavior. For a long time, its advocates recruited themselves from the ranks of school people, while psychiatrists maintained a disinterested aloofness. Homburger's departure from this attitude brought child psychiatry and education into close contact. He gave teachers an opportunity to participate actively in the study of children. This is very much in contrast with present practices in our midst, where teachers are regarded at best as passive recipients of reports from psychiatrists about their problem students.

While thus mobilizing all the community facilities for the benefit of children with intellectual and emotional difficulties, Homburger was a strong believer in, and competent practitioner of, individual psychotherapy. Yet he realized that there was danger in the growing tendency to do psychotherapy in a social vacuum, with the rather supercilious disregard of symptomatic phenomenology, and with abandonment of all curiosity about somatic integrants of behavior. In 1928, he published an article entitled: "The Dangers of Overstressing the Concept of Psychotherapy." In it, he deplored the trend toward the isolation of psychotherapy from the rest of medicine. He said:

> What I am objecting to is not the practice of psychotherapy, not the deepening of its concept, nor the spread of psychotherapeutic thinking among physicians and medical students to which I have devoted myself for a long time. I do object to the fashionable, self-sufficient routine and to the sectarian, rather conceited, and one-sidedly psychotherapeutic evaluation of the disturbed child.

Lest one get the idea that all this has changed radically, it may be helpful to call attention to David Levy's thoughtful and thought-provoking Academic Lecture before the American Psychiatric Association in 1951. Levy expressed similar concerns and made an eloquent plea for the restoration of respect for the "data of observation," away from unbridled speculation and exclusive preoccupation with a frozen and one-sided routine methodology.

Like Levy, Homburger was a pioneering and productive contributor to child psychiatry and at the same time a keen observer and constructive critic of its development, an enthusiastic builder impatient with the kind of excesses which impede rather than further healthy progress. He has a secure place in the history of child psychiatry.

L. K.

COMMENT

BIRTHDAY TRIBUTE TO CÉCILE AND OSKAR VOGT

Dr. Cécile Vogt celebrated on March 27, 1955, her eightieth birthday and her husband Professor Dr. Oskar Vogt, on April 6, 1955, finished his eighty-fifth year.

The world famous scientists were honored in their Brain Research Institute in Neustadt, Germany, by a delegation from the University of Freiburg with which the Institute is connected.

At the turn of the century Dr. Oskar Vogt started a neurologic research laboratory which a few years later became the Neurobiologic Institute of the University of Berlin and in 1916 was merged with the Kaiser-Wilhelm Institute in Berlin-Buch. In 1937 the Vogts, to maintain their scientific independence, built the present institute, located in the Black Forest.

For a number of years their main interest has been the study of brains of famous men which were willed to the Vogts. In 1924 Dr. Oskar Vogt was one of the neurologic consultants to Lenin in Moscow after he suffered a stroke. At the present, one of the principal research interests of the institute is the question of mental aging.

The JOURNAL salutes with great respect and esteem Dr. Cécile and Dr. Oskar Vogt.

INSTINCTS

Bibring [1] and Kubie,[2] who have recently reviewed Freud's theory of instincts, both picked out for emphasis his 1915 definition of instinct as "the measure of the demand for work imposed upon the mind in consequence of its connection with the body." This definition at first seems cryptic, but when thought through in the light of modern theories of heredity and maturation it makes a good deal of sense. In 1954, Fuller[3], writing on "Nature and Nurture" says: "Heredity is the capacity to utilize our environment in a particular way." Here is a wise and striking epigram from a zoologist who specializes in animal behavior. I shall try to bring these two definitions into meaningful relation.

Heredity must be brought into the discussion because all scientists agree that to some extent what we call "instinct" has to do with inherited (innate, inborn, genetic, unlearned) patterns of behavior. The old polemic about heredity *versus* environment is fortunately outmoded. It still persists among those who would tell us about their favorite horse, dog, or parrot; but scientifically it is dead.

Recently a new discussion of "instinct" has arisen in the realm of animal psychology. Lorenz, the director of the Max-Plank Institute for Ethology in Westfalen, Germany, and Tinbergen, lecturer in zoology at Oxford, have been largely responsible for the development of a new field in zoology called "Ethology," which is essentially the comparative study of animal behavior. It is a science that uses field studies and simple experiments. Impetus was given to its rise because it developed partly as a reaction against the recent trend of experimental psychology, in which a small number of partly domesticated laboratory animals were being intensively studied by increasingly intricate methods. Ethologists, on the other hand, emphasize the study of many species under natural conditions to find out how the behavior patterns came about. Lorenz [4] studies the phylogeny of behavior; he believes that organisms have significant histories; he is interested in causation, and such processes

[1] Bibring, E. Internat. J. Psychoanal. 22: 102, 1941.

[2] Kubie, L. S. Psychosom. Med., 10: 15, 1948.

[3] Fuller, J. L. Nature and Nurture: A Modern Synthesis. New York: Doubleday, 1954.

[4] Lorenz, K. King Solomon's Ring. New York: Crowell, 1952.

as "selective pressure" and "survival value" in the environment. He has been the pioneer in describing social signals which release special behavioral responses. These he has appropriately called "releasers." They lead to sequences of motor reactions important for race survival. Such motor patterns are often greatly ritualized in birds, reptiles, and fishes, less so in mammals. Many interesting analogies can be brought out with human behavior, especially at parturition and during the puerperium. Attacking the problem from the receptor side, he has shown how young animals are profoundly affected, at certain specific stages of development, by environmental events. At these susceptible times they can be "imprinted" by special experiences. Appropriate experiences line them up with the general behavior of the species, but abnormal and experimentally planned experiences can "imprint" them permanently with abnormal behavior patterns.

The ethologists [5, 6] believe that innate behavior patterns ("instincts") are laid down in the neurological pattern of the brain; that their motor patterns are inhibited by higher nervous mechanisms until the appropriate stimulus ("releaser") is applied to the animal. Then the instinctive act is performed automatically and in its complete sequence of motor expressions. The threshold for the releasing stimulus can be lowered by "selective pressure," for example, many of the instinctive patterns are related to mating rituals, display during courting, etc. The rising secretion of sex hormones in the spring is the selective pressure that lowers the threshold and allows release so easily at this season. Greater stimulus might do it at other seasons. Lorenz believes that patterns of motor behavior may occur "spontaneously" if the pressure is high.

In America a number of psychologists [7] and zoologists [8] have taken exception to the views of the ethologists. They believe that the concept of "instinctive acts" as innate, hereditary forms of behavior, is no longer tenable. They believe that the ethologist's description of neuronal patterns, inhibitory mechanisms, and releases is too schematic. They point out that modern students of embryological development show that from the very beginning (after sperm and ovum meet and cell division begins) the development of the embryo is greatly influenced by environment. The genes in chromosomes in each cell are primary guides as to how the cells shall grow and form tissues. But they can guide only in relation to two important and continuous environmental forces:

1. There are chemical changes in the fluid environment as cells multiply and differentiate. These are caused by the cells and affect all cells. At first the changes are simple, the effects of oxygen, carbon dioxide, electrolytes, etc., but later there are complex effects such as those from hormones.

2. Nerve impulses from sense organs play on the growing nervous tissue as soon as it takes primitive form. These afferent impulses are to be looked on as physico-chemical stimuli whose presence or absence affects maturation of the nervous tissue. These stimuli guide its growth by a feed-back process; they cause it to function with its efferent parts, and this leads to more afferent stimuli. This is called "experience" of the nerve cells at first; later in the more mature nervous system it attains the dignity of "learning." Thus, the genic influences on the formation of the organism are basically important, but certainly are not the only directing influences. In fact, Fuller states that "development is a continuous transaction between the organism and its surroundings" and follows this with the definition quoted above, that "heredity is the capacity to utilize an environment in a particular way." His little book is the best guide we have seen to a modern concept of genetics in relation to human problems.

The psychoanalytical concept of "instinctual drive" has little to do with the concept of maturation and inborn patterns of behavior described in the 3 preceding paragraphs. It has much to do with Lorenz' concept of lowered threshold caused by chemical stimulation, which he calls "pressure." Freud's term *Trieb* was badly translated as

[5] Tinbergen, N. The Study of Instinct, Oxford: Clarendon Press, 1951.

[6] Thorpe, W. H. Nature, 174: 101, 1954.

[7] Beach, F. A., and Jaynes. Psychologic. Bull., 51: 239, 1954.

[8] Lehrman, D. S. Quart. Rev. Biol., 28: 337, 1953.

"instinct" [2]; it would have been better if the less specific word "drive" had been used. These "drives" could be anything from a need for oxygen to the complex hormonal stimuli invoked by Lorenz to explain the onset of the courting rituals of birds. So in saying that a "drive" was "the measure of the demand for work imposed upon the mind, in consequence of its connection with the body" Freud is apparently repeating his belief that behavior at the complex interpersonal level (which is explainable by such psychological constructs as the ego—superego—id theory), is profoundly effected by the chemistry of the body, especially its effects on blood circulation, hormones, and nerve impulses. That is no excuse, however, for loose thinkers to confuse the different theoretical and operational levels, and talk of such impossibilities as the effects of alcohol on the superego! The ego and superego are useful psychological concepts with which to explain interpersonal relations. But that is all they are. And concepts are not vulnerable to drugs!

Maturation of the organism, with adult reactions to environment, is attained only by continuous interaction of genes, humoral chemistry, and nerve impulses. Literally, the genes start the cells off to use the environment in a particular way. The chemical and nervous changes keep this process going until an amazingly complex result is achieved which combines species uniformity and individuality.

S. C.

NEWS AND NOTES

Canadian and Ontario Psychiatric Associations.—A combined meeting of these two Associations was held at the Royal York Hotel in Toronto, on Saturday, June 18, 1955, in conjunction with the meetings of the British and Canadian Medical Associations. There were morning and afternoon sessions and the annual dinner in the evening. Speakers included Dr. Robert O. Jones, Halifax (Psychotherapies: Choice of Method), Dr. Desmond Curran, London, England (Developments in Social Therapies), Dr. S. Bernard Wortis, New York City (Recent Advances in Physical Therapies).

Psychiatry was also well represented on the combined program of the British and Canadian Medical Associations. The main psychiatric topics on this program were: Alcoholism in Industry, Depression Reactions, Suicide, Cortical Excision in the Treatment of Focal Epilepsy, Basic Science in Psychiatry, The Place of Psychology and Psychiatry in Medical Education.

This was the third time that the British Medical Association has met in Canada. It held its annual meeting in Toronto in 1906, and in Winnipeg in 1930. At the recent meeting a unique honor was bestowed upon a Toronto physician. Dr. Clarence Routley, for many years General Secretary of the Canadian Medical Association, organizer and first head of the World Medical Association, received the distinction of being elected president of both the British Medical Association and the Canadian Medical Association. Never before has one man held these two offices. Dr. Routley's great services to world medicine were fittingly recognized in this way.

A striking feature of the combined meetings, which extended through the week, was the interest of the delegates from both the British and Canadian Medical Associations in psychiatric issues. At the closing general session, Dr. Desmond Curran of St. George's Hospital, London, forcibly indicated the place of psychology and psychiatry in medical practice. His strong point was that the bulk of psychotherapy in all kinds of sickness must be in the hands of physicians and surgeons in all branches of the profession, and that all medical men should be gratified to undertake it and should do so.

At a special meeting at the Toronto Psychiatric Hospital, Dr Aubrey Lewis, head of psychiatry at the Maudsley Hospital, London, spoke on Dilemmas in Psychiatry. In his usual qualified, felicitous manner he discussed many of the perplexing problems and situations that the psychiatrist encounters in his daily work. With characteristic restraint, while throwing out suggestions pointing up the resources of compromise and common sense, the speaker refrained from offering definitive solutions of these dilemmas.

Dr. Treadway Honored.—On June 19, 1955, the Devereux Foundation of Devon, Pa., dedicated the Walter L. Treadway Hall on the school's campus at Santa Barbara, the California branch of the Devereux Schools.

The guest speaker at the dedication ceremonies was Robert H. Felix, Director of the National Institute of Mental Health, Bethesda, Md.

Dr. Treadway was commissioner in the United States Public Health Service and was active for many years in that Service, becoming eventually Assistant Surgeon General. Since his retirement he has been living at Santa Barbara.

Egyptian Child Welfare Bureau.—Founded in Cairo last October, this organization is the first information and research center specializing in childhood problems in Egypt. The center is now building a library, facilities to be available to all educators and service organizations interested in problems of childhood. It will be the first of its kind in the Middle East.

Supported by no regular subsidies or private donations, the Bureau will gratefully accept gifts of books and periodicals relevant

to its field. All communications should be addressed to the director, The Reverend Victor Gohargui, 14 Sh. El Birgas-Zaidian Building, Garden City, Cairo, Egypt.

Dr. Hargreaves Goes to the University of Leeds.—Dr. G. R. Hargreaves, Chief of the Mental Health Section of the World Health Organization, is relinquishing his post in that organization in order to assume the position of Professor and Head of the Department of Psychiatry at the Medical School of Leeds University in England.

Our congratulations and best wishes go to Dr. Hargreaves in taking over his new duties.

Dr. Hoch Receives Adolf Meyer Award.—Dr. Paul Hoch, chief research psychiatrist at the New York State Psychiatric Institute, has received the 1955 Adolf Meyer Memorial Award for his outstanding contributions in the mental health field as conductor of research, educator, and author.

The award was presented by the Association for improvement of Mental Hospitals at the annual meeting of the New York State Society for Mental Health on April 20, 1955.

Hirschhorn Gift to New York School of Social Work.—Mrs. George E. Brewer, chairman of the School's board of trustees, has announced a gift of $50,000 by Joseph H. Hirschhorn, uranium mining executive, to bring social workers from "areas of substandard living" to the United States for specialized social work study. The gift will provide the expenses of 10 students for 2 years.

Dean Kenneth D. Johnson of the graduate school points out that the gift will provide an opportunity for gifted but needy students from other countries to learn of the democratic way of life of the West which they may bring home to their own people with a view to improved standards of living and health and thus more determined resistance to Communism.

Hirschhorn Fellowships have been awarded to social workers in South Korea, Japan, Formosa, India, Pakistan, Egypt, Greece, Cuba, and the Gold Coast and Union of South Africa. Fellowship classes will begin in September 1955.

This is the first time that a large private contribution has been given to the School for training foreign students.

Dr. Tompkins Head of Psychiatry at St. Vincent's Hospital (New York City).—Dr. Harvey J. Tompkins, director of the psychiatry and neurology service, Veterans Administration, Washington, D. C., has been appointed director of psychiatry at St. Vincent's Hospital, administered by New York Catholic Charities. His appointment became effective June 16, 1955.

In addition to directing treatment, education, and research in the new Jacob L. Reiss Memorial Mental Health Pavilion of St. Vincent's Hospital, now nearing completion, Dr. Tompkins will act as coordinator of all the psychiatric services of Catholic Charities throughout the Archdiocese of New York.

The $2,500,000 seven-story mental pavilion was erected in memory of the late Jacob L. Reiss. It will have accommodation for 97 inpatients with ample facilities for day patients and for the treatment of children.

The "open hospital" plan will be emphasized and therapeutic techniques will be comprehensive, without preference for any particular psychiatric doctrine or school of thought.

Psychotherapy in Psychosomatic Problems.—The University of Minnesota announces a continuation course in office psychotherapy in psychosomatic problems from September 7-9, 1955, to be held at Douglas Lodge in northern Minnesota on the shores of beautiful Lake Itasca.

The course is designed to meet the needs of the general physician and the nonpsychiatric specialist. It will be under the direction of Dr. Donald W. Hastings, head of the department of psychiatry and neurology, University of Minnesota Medical School.

The fee, 130 dollars, will include registration, tuition, meals and lodging, instructional material, transportation to Douglas Lodge and return, and fishing license. Recreational facilities will be available. For further information write to the Director of

Continuation Medical Education, 1342 Mayo Memorial, University of Minnesota, Minneapolis 14, Minn.

Sixth Annual North Shore Health Resort Lecture Series.—Psychiatric Problems in Medical Practice is the theme for the 1955-56 season of this annual lecture series to be held the first Wednesday of every month from October through June, at the North Shore Health Resort, Winnetka, Ill.

The first lecture, "Management of Psychiatric Emergencies," will be given by Karl Bowman, M. D., University of California Medical School, Wednesday, October 5, at 8:00 p.m.

The American Academy of General Practice continues to credit its members with informal postgraduate study for attendance at these lectures.

Further information may be obtained by writing Samuel Liebman, M. D., Medical Director, North Shore Health Resort, Winnetka, Ill.

National Multiple Sclerosis Society.—Fifteen progress reports by experts in the study of multiple sclerosis were read at the Medical Advisory Board meeting of this Society, held at the Conrad Hilton Hotel in Chicago, June 12, 1955. Although promising research projects are being carried out, experts at the meeting emphasized that the cause of multiple sclerosis is as elusive now as it was in 1835 when the disease was first observed and reported.

Since its founding in 1946, the Society has supported 48 research projects, including 5 research clinics, at a total cost of $792,414.

Illinois Psychiatric Society.—On May 18, 1955, the Illinois Psychiatric Society elected the following officers for the year 1955-56: president, Dr. Roy R. Grinker; vice-president, Dr. George R. Perkins; secretary-treasurer, Dr. Samuel Burack; councillors, Drs. Percival Bailey and Charles B. Condon.

Nassau (New York) District Branch.—Newly elected officers of this District Branch of The American Psychiatric Association are; president, Dr. Lester E. Shapiro, Rockville Centre, N. Y.; vice-president, Dr. Ursula G. Stewart, Elmont, N. Y.; and secretary-treasurer, Dr. Irving Chipkin, Hempstead, N. Y.

Eastern Group Psychotherapy Association.—The next meeting of the Association will be held at the New York Academy of Sciences, 2 East 63rd Street, New York City, Friday, October 7, 1955. The business meeting will be called at 8:00 p.m., the professional meeting at 9:00 p.m. The subject for discussion is "The Patient as a Therapist"; the speakers: Dr. Hugh Mullan and Dr. Edrita Fried.

New York Academy of Medicine Annual Fortnight.—The New York Academy of Medicine's twenty-eighth annual graduate fortnight will be held October 10-21, 1955. The program, devoted to Problems of Aging, will consist of 20 evening lectures, 4 evening and 6 morning panel meetings, 19 afternoon hospital clinics, a scientific exhibit, and visits to 5 community educational and recreational day centers for the aged.

Programs and registration cards may be obtained by writing Dr. Robert L. Craig, Secretary of the Graduate Fortnight Committee, 2 East 103rd Street, New York 19, N. Y.

Volunteers in Mental Hospitals.—A pamphlet by this title, recently published by the National Association for Mental Health, Inc., reviews the objectives and the scope of volunteer programs in mental hospitals, and emphasizes the importance of organizing and continuing such programs already established in some mental hospitals.

Written jointly by Marjorie H. Frank, assistant executive director, N.A.M.H., Ruth Evans, former field representative, N.A.M.H., and Dr. O. Kirkpatrick, director, Hudson River State Hospital, *Volunteers in Mental Hospitals* may be purchased for 25 cents from the National Association for Mental Health, 1790 Broadway, New York 19, N. Y.

American Group Psychotherapy Association Western Regional Meeting.—

A transcription of the proceedings of the first annual Western Regional Meeting, held at the University of California, June 4-5, 1954, has been prepared in pamphlet form by Dr. D. A. Shaskan and Dr. H. S. Morgenstern from electronic recordings of the formal meetings, including both papers and discussions. Copies are available at 2 dollars per set from Dr. Shaskan, 259 32nd Avenue, San Francisco 21, Calif.

WHO REPORTS ON DRUGS.—The fifth report by the World Health Organization Expert Committee on Drugs Liable to Produce Addiction is now available in the United States through the Columbia University Press International Documents Service, 2960 Broadway, New York 27, N. Y., at 30 cents per copy.

The pamphlet contains information regarding the addiction potential of morphine, narcotine, and synthetic substances of various kinds, as well as reports on special problems in drug addiction.

RECENT ADVANCES IN THE MAZE TEST.—Pacific Books, Palo Alto, Calif., has published a paper-covered booklet describing recent progress in the development of these tests. Contents include a general survey of recent advances, detailed information with regard to methods of scoring, and a bibliography.

Copies may be obtained from the publisher at 2 dollars each; the mazes are sold by the Psychological Corporation, 522 Fifth Avenue, New York 36, N. Y.

ARCHIVES OF CRIMINAL PSYCHODYNAMICS.—The first number of this new journal, founded and edited by Ben Karpman, has appeared. It is dated Winter, 1955, and is published in Washington, D. C. It is psychoanalytically oriented. This first issue includes 246 pages of text; there are to be 4 issues to the volume; price $10 per volume.

The interesting feature of the first number is the introduction and platform by the Editor. It runs to one hundred pages. He explains that "originally intended as a relatively brief statement, the material has gotten somewhat out of control," which is not altogether out of keeping with the Karpman pattern. But he adds—and this is what lends special interest to the Introduction—that it is "a mosaic, or synthesis if you will, of most of my own contributions on the subject especially dating after 1940, cemented by the addition of relevant material from other sources." Thus some 30 of Dr. Karpman's publications are dealt with and these hundred pages constitute therefore not only an introduction to the new journal, but also an introduction to the Karpman opus.

Dr. Melitta Schmideberg is associate editor, and 12 others make up the editorial board. In addition to original articles, the Archives includes book reviews, abstracts from the literature, and some poetry.

The JOURNAL extends cordial greetings to the *Archives of Criminal Psychodynamics*.

Correspondence should be addressed to the Editor, Station 1, Washington 20, D. C.

THE INDUCTIVE METHOD

Reasoning is fallacious if not based upon facts; but facts and reasoning should go hand in hand; for if the facts are not able to support the reasoning, then reasoning is good for nothing, they should always bear a due proportion . . . the man who judges from general principle only, shows ignorance; few things are so simple as to come wholly within a general principle. . . . We should never reason on general principles only, much less practice upon them, when we are, or can be master of all the facts; but, where we have nothing else but the general principle, then we must take it for our guide.

—JOHN HUNTER

BOOK REVIEWS

The Meaning of Social Medicine. By *Iago Galdston, M. D.* (Cambridge: Harvard University Press, 1954. Price: $2.75.)

The Meaning of Social Medicine is a little book on a very big subject. In an age oft threatened by tidal waves of printer's ink one is grateful to Dr. Galdston for having condensed his argument into some 115 pages. Since the subject matter of the book is of great complexity and urgency, he forestalls intellectual "stuttering" by starting out with a clarifying distinction between "socialized medicine" and "social medicine." The much heralded "socialized medicine" is concerned primarily with the distribution of the benefits of medical treatment and is therefore largely a government function, whereas the budding science of "social medicine" seeks to discover the social foundations of the whole of medicine: its philosophy and resulting methodologies. In summary: "Social Medicine . . . embraces the study of the environment with man in it."

The author boldly states his disaffection with mere curative medicine. Despite the great achievements of bacteriology in identifying and eliminating specific noxious agents, society's burden of disease is still growing. Trenchant is the author's summation that "modern medicine has in a large measure converted mortality into morbidity." He further criticizes the "starchy" exponents of etiological medicine and decries the silencing of the voices of Pettenkofer and others who refused to be thrown into "buck fever" by the discovery of a specific germ. The emphasis on the invader threatened indeed to blot out the role of the invaded.

Without denying the reality of specific pathogens the author challenges the right to consider them as the *causa causans* of the ultimate configuration of disease. The harboring of pneumococci may precipitate pneumonia in one individual and fail to do so in others. This well-known fact of individual pathology is extended to a consideration of the "epidemic constitution" of a society. In a very stimulating study of the French medical historian and epidemiologist, Ozanam (Bulletin of the History of Medicine, Supplement No. 3, 1944), Galdston defines the core-problem of epidemiology as being: "not what caused *this* epidemic or *that* epidemic, but rather what makes it possible for epidemics to prevail among peoples." He traces the concept of the epidemic constitution from Hippocrates to Sydenham and onward as a "generic factor common to all species of epidemic disease." That factor may be found in a specially susceptible sick society. The author finds valid support for this point of view in the case of the horrible influenza-pneumonia pandemic of 1918. The etiological explanation of the Pfeifer bacillus proved to be a scientific mirage, but there are very few who now doubt the causality of the shock administered to society by the experience of a near-total war.

The relative incidence of types of mental illness in various cultures has been treated by this reviewer in a survey entitled "Observation on Cultural Psychiatry During a World Tour of Mental Hospitals" (Am. J. of Psychiat., Vol. 108: 462, Dec. 1951). The facts presented there pointed to a positive correlation between cultural situations and certain mental disease processes, even though no definite claims could be made as to the how and why of such linkages. Galdston's thesis is far more encompassing. While granting psychiatry its due, he is evidently concerned that "social medicine" should not be regarded as a psychiatric subspecialty. Were it not for this consideration, one might wonder why the author treats of the contribution of psychoanalysis to this field in a somewhat cursory manner. It is of course true that from Hippocrates, Sydenham, Virchow, and Cannon down to Hans Selye the emotional stresses of the patient as a member of society have been given increasing attention. However, if we are to witness the growth of psychosomatic medicine on a social scale, the dynamics of unconscious motivation and reaction patterns are bound to engage our deepest concern. A corrective of the above underemphasis is found in the author's strong plea for a socio-cultural orientation in medical education. We are to prepare the future physician for his classic function as a doctor, *i.e.*, a teacher of health.

The meaty little volume ends with a survey of the development of "Social Medicine in England." Its course is traced from the reaction to the abysmal distress caused by the Industrial Revolution. It is highlighted by the humaneness emanating from Florence Nightingale. It is seen taking shape in the socio-political planning of the Beveridge report and other parliamentary health acts following the social dislocations of two world wars. It finally attains academic enthronement in the pioneering personality of Professor John A. Ryle.

Having now said enough to prove that the reviewer read the book, an earnest word might be added to recommend its reading by all vitally concerned in the growth of medicine. The reader will not only be rewarded by an illuminating scientific discussion, he will also share in a cultural experience because of the author's dialectic skill and historic perspectives.

Henry Raphael Gold, M. D.,
New York City.

The Construction of Reality in the Child. By *Jean Piaget.* Translated by Margaret Cook. (New York: Basic Books, 1954. Price: $6.00.)

Directly in the tradition of the early classical writers on child development, Taine, Darwin, and Preyer, this book by the great Swiss philosopher and psychologist, Piaget, is based on observations on his own children. Many other analogies could

be drawn between Piaget and his nineteenth-century predecessors; that they were in large measure naturalists and philosophers and that like Wilhelm Preyer's monumental work, this is one of a trilogy. However, Piaget has built upon 2 decades of his own observation and experimentation as well as that of his predecessors and reached new and illuminating theoretical heights.

This volume, first published in 1937 as *La construction du réel chez l'enfant*, is the middle work of the trilogy made up of *La naissance de l'intelligence chez l'enfant* (1937), and *La formation du symbole chez l'enfant* (1945). Like practically all of the author's psychological writings this work stems from his insatiable, lifelong, epistemological interests. Beginning with the hypothesis arrived at in his adolescence, that all evolution, including that of the intellect, proceeds in terms of structures-of-the-whole or from the totality to the particular, Piaget describes the development of reality and conceptual thinking from sensorimotor activity in the child, within the first 2 years of life. He proceeds painstakingly and logically from the development of the concept of an object, gradually moving this object through space and time to the development of the concept of causality and finally from the simplest sensorimotor origins to the child's concept of the universe. The structure of the book is deceptively simple. Piaget states and discusses a hypothetical construct and then offers proof from observations on one or more of his 3 children, Lucienne, Jacqueline, and Laurent. These observations are largely naturalistic but simple experiment and some comparative observations are also included.

Everything is grist to his mill. The amazingly sensitive and almost intuitive insight into behavior is fascinating to follow through the intricacies of his logical structure. One can forgive Piaget any potential error after reading the work. It no longer matters that teleology is rife, or that in view of findings by others some of the explanations of origins of some behavior patterns are probably invalid. In almost 400 pages of closely printed text there are probably not more than 2 dozen references, most of these to his own writings and those of his co-workers. I cannot recall reference to a single American source. Much to support or contradict his impressions exists in the literature. Elsewhere, Piaget has said that he "could not think without writing," and this is precisely what he has done here. The book is not a report of an investigation but rather a philosophic treatise supported by acute observation. In the course of the writing, he has constructed enough hypotheses to occupy the lifetimes of a host of investigators. It is one of the supremely irritating phenomena that there are more individuals creating hypotheses than persons attempting to test them. Unlike many, Piaget realizes that his are hypotheses requiring experimental validation and has, himself, done much in that direction for more than 30 years. Above all, his hypotheses are testable which unfortunately cannot be said for many in the field of psychodynamics. Piaget's writings are fundamental and genuine psychodynamic literature and are essential to any rounded appreciation of this area.

The dust cover lists this as one of the basic classics in psychology and there is little doubt that it will remain so for all time. It is therefore surprising that there is no historical introduction locating this landmark on the map of psychologic thought or even among Piaget's 22 volumes. It is not stated that it is one of 3 volumes making a totality from which this volume is not completely separable. Even the year of original publication is not given, as if it were feared that no one would care to read a book 17 years old. This is somewhat shabby treatment of a classic. Even more annoying is the absence of an index. Nevertheless we should be grateful for even the bare printing of the work. Not knowing the original I cannot judge the translation, but recalling Piaget's uncompromising way with the reader, I imagine that some of the heavy going is not the fault of the translator.

Piaget once wrote that he had begun to write quickly "for fear that I might not finish in time if the world situation should again become troubled.... I hope to be able some day to demonstrate relationships between mental structures and stages of nervous development, and thus to arrive at that general theory of structures to which my earlier studies constitute merely an introduction." Let us hope that he is able to work undisturbed for if anyone living could do this, Piaget is the man.

BENJAMIN PASAMANICK, M. D.,
School of Hygiene and Public Health,
The Johns Hopkins University.

HYPEROSTOSIS CRANII. By *Sherwood Moore, M. D.* (Springfield: C. C. Thomas, 1955. Price: $10.50.)

In the preface of this book Dr. Moore writes apologetically, "There is such an extensive literature on the subject of this book that an additional publication may be redundant." Nevertheless, he has attempted to present evidence supporting the concept that there is a clinical syndrome associated with hyperostosis cranii. Although the book is replete with charts, photographs of roentgenograms and graphs, the cause, pathogenesis, and clinical significance of hyperostosis cranii remain as enigmatic as ever.

The author concludes that hyperostosis cranii falls into 4 types and 3 degrees of development; that there can be a number of combinations of the 4 forms; that the clinical findings are identical in all types; and that the degree of the hyperostosis is not a measure of the intensity of the syndrome, since third degree hyperostosis can exist without accompanying symptoms and symptoms can be present without demonstrable hyperostosis!

T. L. L. SONIAT, M. D.,
Ochsner Clinic,
New Orleans, La.

The Peptic Ulcer Individual. By *Gerdt Wretmark.* Translated by *L. James Brown.* (Copenhagen: Ejnar Munksgaard, 1953.)

This book is of exceptional character: it combines comprehensive discussions of the vast literature with the report of the author's original investigations of 2 unique peptic ulcer series. The lack of generally accepted evidence of psychosomatic factors stems, in the opinion of the author, from fragmentary studies which fail to include unobjectionable control series. It remains to be shown how peptic ulcer individuals differ from the rest of the population in terms of dimensions of personality, predisposition, and heredity.

The unusually thorough and comprehensive approach which characterizes this investigation was favored by the cohesiveness of the Swedish population as well as the ease with which follow-up observations can be organized under the Swedish medical system. The first series consists of 164 male patients, treated for gastric or duodenal ulcers at the medical department of the Central Hospital in Örebro; the second series comprises 128 psychiatric patients at Sahlgren's Hospital, Gothenburg, who had gastric or duodenal ulcer. The controls for the first series were chosen by tracing the names of the patients of this series in the district register where all inhabitants are recorded according to date of birth. The name of the next male Örebro resident was noted and the man selected as control. If this control was found to have a history of peptic ulcer, the one next in the register was chosen and so on. In this way, the age distribution was practically identical with that of the ulcer series. For the second series, a male control born within the same 5-year period with the closest subsequent hospital record was taken. The author points out that his control series are unique in their unselected composition; that they are superior to any other control series in the literature. He consequently places great emphasis on the significance of this methodological advantage.

Psychiatric, familial, somatotypical, anamnestic, and statistical examinations are presented in great detail and illustrated with many tables and diagrams. Some of the most interesting findings will be briefly stated. Duodenal ulcer is more common than gastric ulcer. Many data suggest that gastric ulcer and duodenal ulcer should be considered separate clinical entities. Duodenal ulcer shows greater tendency to familial occurrence than gastric ulcer. Duodenal ulcer shows a predilection for individuals of tall-narrow body build. The prognosis of duodenal ulcer in persons of this body build is less favorable than in persons with wide-heavy body build. It is difficult to deny the existence of a constitutional background in ulcer disease. Findings of Kretschmer on the relationship between body build, vegetative mode of reaction, and phychophysiologic irritability can be related to peptic ulcer etiology. Personality studies, based on Sjöbring's theory of personality variation, revealed that duodenal ulcer individuals differ statistically from the controls, whereas those with gastric ulcers do not. Duodenal ulcer individuals manifest higher intellectual capacity, lack the characteristics of syntonic personalities and seem frustrated because of discrepancies between their aspirations and their possibilities to achieve them. There emerged sufficient evidence to conclude that the dimensions of personality, body build, and autonomic dysfunctions are constitutionally correlated and indicate an inherited predisposition.

One must agree with the author's conviction that the psychosomatic theory of peptic ulcer has not received the quantitative research attention which it merits. The value of this report lies in the vast amount of work and the extensive scope of investigative techniques. The availability of the control material eliminates methodological shortcomings which lessen the validity of many otherwise brilliant studies on the same subject. To compose 2 series of ulcer patients, one with and the other without psychiatric disorders, each matched by a control series singularly free from flaws of selectivity, gives proof of the author's superior research ability. Many of the data as well as the techniques by which they were gathered should be evaluated by specialists in these fields of research. Psychiatrists and psychologists in this country may dismiss Sjöbring's theory of personality variation as too descriptive and look in vain for interpretations of the experiential-dynamic aspects in the personality studies. The fact that significant differences were found between the individuals with and those without duodenal ulcers suggests strongly that specific personality factors were brought into focus.

The arrangement of the contents appears rather clumsy as repetitious chapter discussions and subsummaries interfere with clarity of presentation. A greater condensation of final data would greatly benefit the book. Without doubt, however, this work must be regarded as a major contribution to the psychosomatic literature on peptic ulcer. Its methodological advantages command serious reconsiderations of etiological concepts which ignore or question the significance of constitutional factors.

Fritz A. Freyhan, M. D.,
Farnhurst, Del.

Manual of Psychological Medicine for Practitioners and Students. Third Edition. By *A. F. Tredgold and R. F. Tredgold.* (London: Bailliere, Tindall and Cox, 1953. Distributed in the United States by Williams and Wilkins Co., Baltimore. Price: $7.00.)

Events in the unwritten chapters of history have a curious assertiveness in unfolding themselves, as if in accordance with some prearranged plan, despite opposition and antagonism. So it is that, although there are still Freudians and anti-Freudians, psychoanalysis asserts itself with a certain inevitableness in dictating the history of psychiatry in America and, more tardily, in England also. There is something of an anachronism, therefore, about a newly published manual of psychiatry which rather petulantly mentions psychoanalysts in the same sentence as quacks, and which is indebted to Freud

only to the extent of borrowing his early outline of the 4 neuroses, namely hysteria, obsessional states, anxiety states, and neurasthenia. There is also an anachronism about a text that in 1953 prescribed as little as 300,000 units of penicillin twice a day for 7 days, then a course of induced pyrexia, then, perhaps, a course of bismuth or arsenic, as the treatment for syphilitic disease of the brain; or that prescribed bromide and luminal as usually preferable to dilantin in the treatment of epilepsy. Tredgold's psychiatric handbook, *Manual of Psychological Medicine*, would have been a milestone in English psychiatry had it first appeared in 1903 instead of 1943. The appearance posthumously in 1953 of a third edition, revised by the original author with the assistance of his son, must surely be indicative of a demand which could have arisen only in a psychiatrically starved and backward medical community.

The psychiatric theory on which the book is based is in part conventional and in part idiosyncratically, even irresponsibly, conjectural. Thus, an example of conventional theory is the distinction between brain and mind, between organic and nonorganic psychiatric diseases. The organic diseases include the usual toxic conditions and brain injuries, and all examples of mental decay and mental defect, for which a constitutional basis or predisposition is postulated should it not be demonstrable. Mental defect and mental decay are 2 of the 3 major categories of mental disease; the third is mental disorder. It is allowed that some mental disorders may have an organic correlate as yet undemonstrated. Thus, schizophrenia is dealt with twice, once as a mental disorder and again as a mental defect, under the heading of schizophrenic amentia.

An idiosyncratic and conjectural part of Tredgold's psychiatric theory pertains to the diseases which he categorizes as mental disorder. These diseases are caused by 2 groups of factors, "first, a predisposition, usually inherited, and secondly, environmental stress" (p. 20). Most patients with an inherited predisposition to mental disorder "come of stocks characterized by an unusual number of their members being affected with different kinds of mental abnormality. Thus, one member may be a manic-depressive, another a schizophrenic, another a sufferer from presenile dementia, mental defect, mental instability, or a psychoneurosis" (p. 19). Since tuberculosis and diabetes are also regarded as abnormally prevalent in psychopathic stocks (p. 217), the horses of inherited predisposition are flogged so nearly to death that they may as well have been abandoned for dead.

Another idiosyncratic and conjectural part of Tredgold's psychiatric theory is contained in his abridged revision of McDougall's theory of personality. The penultimate paragraph of the first chapter reads as follows: "There are other persons, however, who advance to a higher plane, in that they devlop the higher sentiments and ideals of behavior. They are not actuated by fear of consequences and the personal advantages to be gained by compliance with the laws of society, but by feelings of honour, duty, personal obligation, justice, social ideals and moral aspirations. Such sentiments and ideals when firmly incorporated into the structure of mind exert a far greater control over primitive urges than does the mere fear of consequences. . . ."

The tone of moralizing in this paragraph paves the way for an overemphasis on conduct to be judged, with too great a lack of scientific and medical impartialness. Hysteria, for example, is defined as "a functional disorder of mind characterized by the unconscious production of mental and physical symptoms which enable the individual to escape from some difficulty or to gain some real or imaginary advantage" (p. 55). Diagnostically, therefore, the physician must always be on the lookout for hysteria when such matters as insurance compensation claims are at stake. Therapeutically, removal of the symptoms "can usually be accomplished with comparative ease, either by firm insistence, persuasion, or suggestion, the latter with or without hypnosis" (p. 63). Subsequent psychotherapy is advised and, in a later chapter, 8 pages are devoted to this method of treatment. In a nutshell, "the chief methods of mental treatment are reassurance, explanation, persuasion and suggestion" (p. 279).

Another example of a judicial and forensic emphasis is the author's treatment of mental and moral deficiency in close conformity with definitions laid down in the English Mental Deficiency Act of 1927. The use of intelligence tests, for the ascertainment of educational capacity during the school age, is mentioned, but the author admits: "Personally, I never use the Binet-Simon scale for the diagnosis of defect as defined by the Mental Deficiency Acts, nor am I interested in what may be the individual's I.Q." (p. 258).

With regard to theoretical matters, especially in so controversial a field as psychopathology, a reviewer's opinions are as much open to debate as those of the author under review. There is, however, no place for dogmatism and bias in dealing with such a topic as cretinism. Tredgold makes statements about cretinism that are outmoded, wrong, and therapeutically dangerous (p. 250-251).

While allowing that in the majority of cases of cretinism the family history is normal, he says, in discussing causation. "In a proportion of cases, there is a definite psychopathic family history, similar to that in ordinary aments." This statement is nonsense.

Under the heading, pathology, one finds: "The brains of cretins who have remained defective, whether they have or have not been treated, show a paucity and incomplete development of cortical cells similar to that in primary amentia." This statement is not accurate. Though histological anomalies in the brain cells of cretins have been found, frequently no pathology can be demonstrated histologically.

The first sentence under the heading, mental and physical features reads thus: "The child is usally normal at birth, and it is not until he is about six months old that anything peculiar is noticed." This

statement is totally misleading. While hypothyroidism may have its onset at any age of life, in its congenital form thyroid deficiency may be so acute at birth that, no longer supplied with maternal thyroid hormone through the placental circulation, the baby shows full-blown symptoms of cretinism between 1 and 2 months of age. The diagnosis can be established with certainty on the basis of clinical symptoms and laboratory tests, including bone X-rays and radioiodine uptake, neither of which are mentioned.

Misinformation with respect to diagnosis of cretinism is especially regrettable, owing to the extreme practical importance of beginning treatment at the earliest possible moment. With some exceptions, infants diagnosed and treated before the age of 6 months subsequently achieve an IQ rating of average or better. With every month of delay in treatment, there is an increase of irreversible impairment of IQ.

Not only is earliness of treatment of utmost importance, but also the amount of medication prescribed. Once again the book is erroneous and sadly behind the times. The dosage of thyroid should not be held so low as ¼ grain between 6 and 18 months of age, and the rate of dosage increase should not be ¼ grain annually, up to a maximum of 5 grains. The correct treatment of cretinism is as follows: Very young infants should begin treatment with ¼ grain daily of dessicated thyroid standardized according to the U.S.P., and older infants on ½ grain daily. The dosage should be increased by ¼ grain increments every 3 or 4 weeks until optimal therapeutic effects are obtained, or until tolerance has been reached. The optimal dosage must be ascertained, on the basis of clinical and laboratory findings, for each individual patient. Under the age of 2 or 3 years, most cretins usually need 1 to 2 grains daily, while those older require 2 to 3 grains.

In conclusion, *Manual of Psychological Medicine*, by Tredgold and Tredgold, is sufficiently slipshod in its facts and biased in its conjectures to be dangerous and misleading to students making their first acquaintance with psychological medicine, and an impediment to those practitioners who have a genuine interest in psychological illness and in unraveling its many baffling problems. It is to be hoped that dissatisfaction with this third edition will grow so great that the junior author will meet the challenge with a completely new volume.

JOHN MONEY, PH. D.,
The Henry Phipps Psychiatric Clinic,
The Johns Hopkins Hospital.

TREASURY OF PHILOSOPHY. Edited by *Dagobert D. Runes, Ph. D.* (New York: Philosophical Library, 1954. Price: $15.00.)

The editor tells us that there are about 10,000 men and a score of women who may claim to be classed as philosophers. Pondering the multitude of definitions of philosophy after he had completed his book the editor could only conclude that "philosophy is the search for the indefinable." Which suggests the view of an earlier commentator that all the wealth of words that have been uttered and written about the "absolute" and the "infinite," with which philosophy in pure culture deals, conveys no meaning to such as "have not the faculty of understanding the unintelligible."

Insofar then as the pure philosopher may be either a mere dialectitian or a pursuer of an *ignis fatuus*, may it not be a high tribute to the female sex that the compiler of this book of 1,280 pages found only a score of women who might qualify as philosophers as against 10,000 males? At any rate of 10,020 or so possibilities Editor Runes selected about 400 persons, including one woman, excerpts from whose writing make up this Treasury.

The authors are arranged alphabetically from Abailard to Zeno the Stoic and the space allotted to each ranges from one page to 18 (Thomas Hobbs, Plato). All the great names are here and a multitude of lesser ones who had something to say, whether or not strictly philosophical, depending on one's definition.

For a sampling let us take every tenth name: Abailard, Alcuin, Anaximenes, Sri Aurobindo, Roger Bacon, Berkeley, Bradley, John Burroughs, Chrysippus, Comte, Nicholas of Cusa, John Dewey, George Eliot (the lone woman), Fechner, Etienne Gilson, Judah, Helevi, Helmholtz, Höffding, Husserl, Jamblicus, Joubert, Lamarck, Lenin, Locke, Machiavelli, McDougall, Montaigne, Nietzsche, Pascal, Plando, Proclus, Romero, Saint-Simon, Seneca, Spinoza, Tertullian, Vivekananda, Christian Wolff, Zeno the Stoic.

The time span is from the sixth century B. C. to today.

Under each writer's name is a short biographical sketch, a list of his major works, and an estimate of his significance in the field of philosophy broadly conceived. This informative introduction to each author adds substantially to the value of the work. Much of the material presented here appears in English translation for the first time.

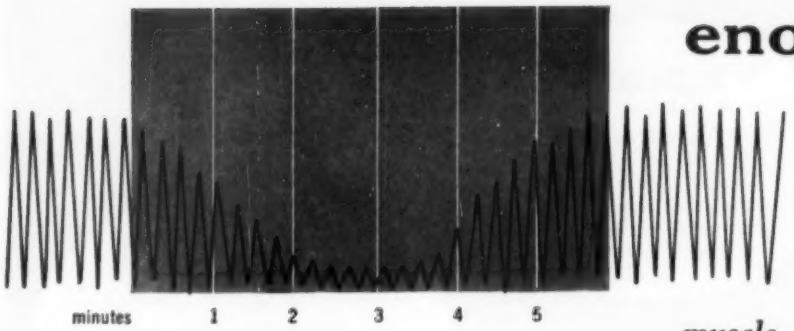
At the end of the volume is a list of references to the sources of the quoted excerpts. A full index is also provided.

It is the conventional thing for reviewers of anthologies to wonder with raised eyebrows why this writer was included and that other omitted. So might we here; but after all the editor who has taken the great pains to assemble the vast material composing this book must not be grudged the right to make his own selections. There are names here that would not be admissable by any strict or professional definition of philosophy; only the popular or colloquial use of that word, whereby any striking or well-stated opinion about almost any aspect of human experience may be called philosophy, justifies their inclusion.

However, the editor has ranged the field from the Orient to the West through the ages and the result is a useful work of reference, as well as desirable for general reading, which will widen the cultural horizon of anyone save possibly a few experts.

C. B. F.

brief enough



muscle relaxation for E. C. T.

No longer need the advantages of muscle relaxation during electro-convulsion therapy be foregone because of the disadvantage of prolonged effect. Speed of action and recovery are characteristics of 'Anectine' medication.

'Anectine' produces full relaxation within 90 to 120 seconds of injection; the effect lasts about 2 minutes, and recovery of muscle tone begins immediately thereafter.

As with all relaxants, facilities for oxygen insufflation must be available when 'Anectine' is given. When apnea does occur, its average duration is about 2 minutes.

References: Wilson, W. and Nowill, W. K.: Southern Psychiatric Meeting, 1952.

Holmberg, G. and Thesleff, S.: Am. J. Psychiat. *108*:842, 1952.

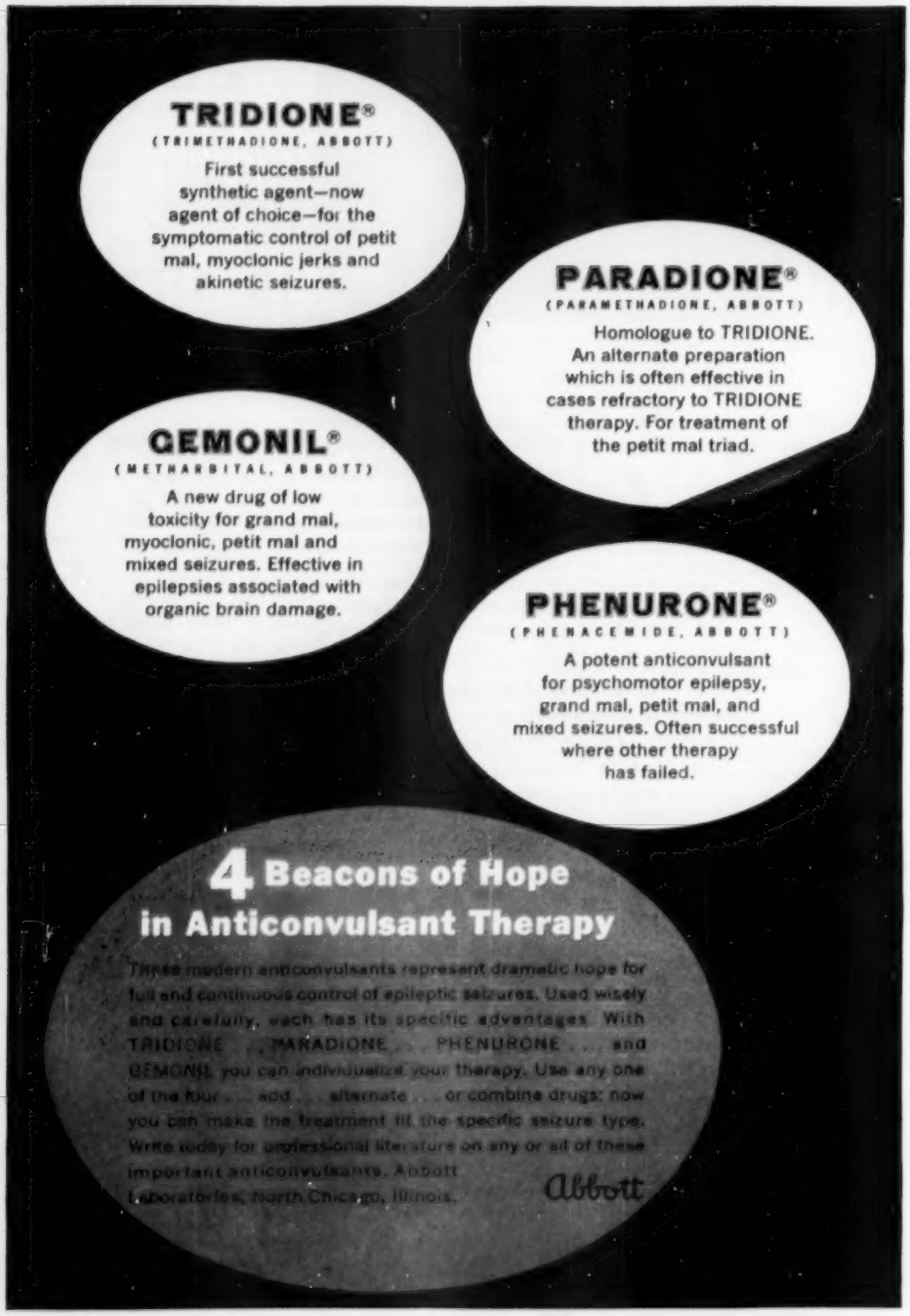
'Anectine' *Chloride brand*

SUCCINYLCHOLINE CHLORIDE INJECTION

20 mg. in each cc.
Multiple-dose vials of 10 cc.
Ready for intravenous injection.

For full information, write to –

Burroughs Wellcome & Co. (U.S.A.) Inc., *Tuckahoe 7, N. Y.*


TRIDIONE®
(TRIMETHADIONE, ABBOTT)
First successful synthetic agent—now agent of choice—for the symptomatic control of petit mal, myoclonic jerks and akinetic seizures.
PARADIONE®
(PARAMETHADIONE, ABBOTT)
Homologue to TRIDIONE. An alternate preparation which is often effective in cases refractory to TRIDIONE therapy. For treatment of the petit mal triad.
GEMONIL®
(METHARBITAL, ABBOTT)
A new drug of low toxicity for grand mal, myoclonic, petit mal and mixed seizures. Effective in epilepsies associated with organic brain damage.
PHENURONE®
(PHENACEMIDE, ABBOTT)
A potent anticonvulsant for psychomotor epilepsy, grand mal, petit mal, and mixed seizures. Often successful where other therapy has failed.
4 Beacons of Hope in Anticonvulsant Therapy
These modern anticonvulsants represent dramatic hope for full and continuous control of epileptic seizures. Used wisely and carefully, each has its specific advantages. With TRIDIONE . . . PARADIONE . . . PHENURONE . . . and GEMONIL you can individualize your therapy. Use any one of the four . . . add . . . alternate . . . or combine drugs: now you can make the treatment fit the specific seizure type. Write today for professional literature on any or all of these important anticonvulsants. Abbott Laboratories, North Chicago, Illinois.
Abbott

Upjohn

Relax

the nervous, tense, emotionally unstable:

Reserpoid *(Pure crystalline alkaloid)*

TRADEMARK FOR THE UPJOHN BRAND OF RESERPINE

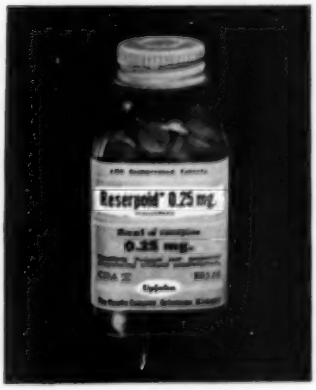
Each tablet contains:

Reserpine . . . . . 0.1 mg.
or 0.25 mg.
or 1.0 mg.

Supplied:

Scored tablets
0.1 and 0.25 mg. in bottles of 100 and 500
1.0 mg. in bottles of 100

The Upjohn Company, Kalamazoo, Michigan



TRAPPED! *A TRAGEDY OF NO ESCAPE*

This Could Have Been Avoided With Chamberlin Psycho-Security Screens With Outside Emergency Lock Releases

Yes, Chamberlin hinged Psycho-Security Screens in place of bars and fixed wire guards, are indeed a modern protection when equipped with emergency lock releases. They insure against the tragedy of no-escape in case of fire, and thus they go a long way toward reducing the hazard of public liability damage suits, and public investigations.

CHAMBERLIN HAS INSTALLED MORE PSYCHO-SECURITY SCREENS THAN ALL OTHER COMPANIES TOGETHER

In the Psycho-Security Screen field Chamberlin leads in design, engineering, manufacturing and advisory know-how. You can depend upon the ethics and the service to be expected from a concern that's been in business 57 years.

3 TYPES MEET PATIENT NEEDS

Detention (1): To withstand the fury of violent attack
Protection (2): For the less violent patient
Safety (3): For mildly disturbed patients requiring protective custody

WHAT PRICE PEACE OF MIND?

In addition to these emergency values, Chamberlin Psycho-Security Screens are like a firm hand in a velvet glove in the endeavor to bring peace and ultimate recovery to disturbed patients.

They imply no sense of restraint because they look like an insect screen and, in fact, function as such. Yet the high-tensile, shock-absorbing, stainless steel mesh insures against damage to windows and hazards of self-injury, suicide and escape.

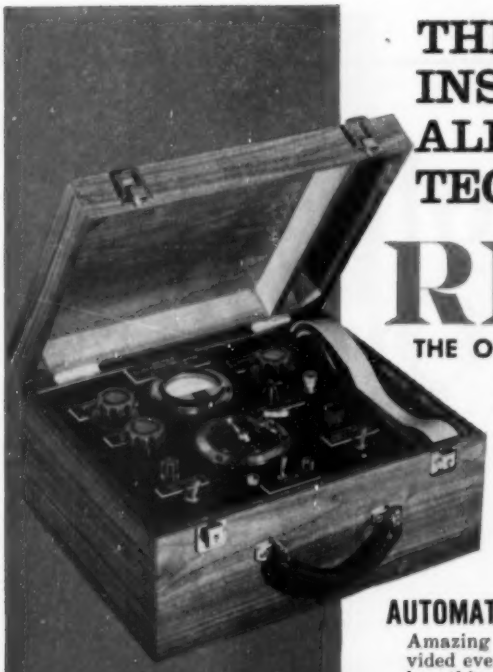
Insist on

CHAMBERLIN
CHAMBERLIN COMPANY OF AMERICA

unequalled for security

CHAMBERLIN COMPANY OF AMERICA
Special Products Division
1354 LA BROSSE STREET • DETROIT 32, MICHIGAN

CHAMBERLIN INSTITUTIONAL SERVICES also include Mineral Wool Insulation, Metal Weather Strips and Caulking, Metal Combination Windows and Doors, Metal Insect Screens, Aluminum and Fiber Glass Awnings.



THE LATEST INSTRUMENT FOR ALL ESTABLISHED TECHNIQUES

REITER

THE ORIGINAL ELECTROSTIMULATORS

MODEL RC-47C

- CONVULSIVE THERAPY — full range
- FOCAL TREATMENT — unilateral and bilateral convulsions
- NON-CONVULSIVE THERAPIES
- MONO-POLAR TREATMENT — non-convulsive or convulsive
- BARBITURATE COMA AND OTHER RESPIRATORY PROBLEMS
- ELECTRO-SLEEP THERAPY

REITER ELECTROSTIMULATORS ARE USED BY THE FOREMOST PRACTITIONERS AND INSTITUTIONS IN THIS COUNTRY AND ABROAD.

More than 140 references in literature and text-books.

FREEDOM FROM SIDE EFFECTS

Model RC-47C provides remarkable freedom from physical thrust, confusion, apnea, memory loss and other side effects.

AUTOMATIC SAFEGUARDS

Amazing reduction of thrust is automatically provided even at full scale current. Patients are often breathing before completion of seizure.

PREFERRED FOR AMBULATORY PRIVATE PRACTICE

During treatment patients do not disturb quiet office atmosphere since confusion and excitements are avoided. These features are equally valuable in hospitals.

VERSATILE — EASY TO OPERATE

The simple controls allow all established techniques. Merely switch to treatment and adjust current with only one control knob.

INCREASED EFFICIENCY OF CURRENTS

Minimal stimulation is required to produce an effective seizure. The use of such biological currents tends to eliminate the undesirable electrical energy component which is the cause of unwanted side effects.

RUGGEDNESS AND ACCURACY

These instruments do not require adjustment for very long periods of time. Yet they are so accurate as to allow for delicate work within the brain.

ADVANCED TECHNIQUES

Current, improved techniques are based on Model RC-47C and provide the means of treating resistant and difficult cases with therapeutic success.

REUBEN REITER, Sc.D.

38 WEST 48th STREET, NEW YORK 36, N. Y.

PRINTING • LITHOGRAPHING • GRAVURE • BOOKS • FOLDING BOXES • LABELS

Controlled Quality

for Printing Satisfaction

In this new four-acre plant—one of the most modern and completely equipped in America—The Lord Baltimore Press produces a wide range of high quality printing and packaging requirements.

Lighting and atmospheric conditions are standardized for uniform and efficient results. Raw materials, reproduction methods and finishing processes are under laboratory control. Skillful technical advice, editorial assistance and functional designing are available to supplement our mechanical facilities.

Satisfying and helping the customer are our principal concerns. May we have an opportunity to discuss your printing needs?

THE LORD BALTIMORE PRESS

Edison Highway and Federal Street
BALTIMORE 13, MARYLAND

NEW YORK: 477 Madison Ave.
CHICAGO: Suite 1928, 333 N. Michigan Ave.
LOUISVILLE: Starks Bldg., 4th & Walnut St.
LOS ANGELES: 1231 S. Main St.

CHLORAL HYDRATE for RECTAL ADMINISTRATION

- *In nausea and vomiting*
- *As pre-anesthetic (no injection)*
- *Post-operative (no water)*
- *To quiet the hypertensive child*
- *To control convulsions*
- *For children who refuse oral medication*

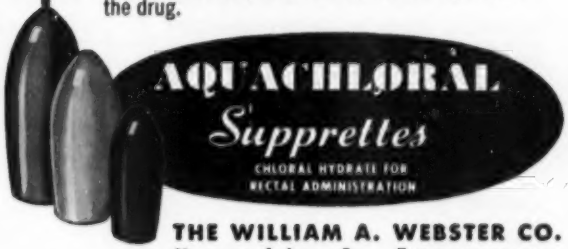
RAPID, SAFE SEDATION WITHOUT HANGOVER

Now chloral hydrate can be given in **measured** rectal dosage without gastric irritation, and in cases where oral administration is difficult or impossible. Aquachloral Supprettes do not require double oral dose as ordinary suppositories, **because of Webster's exclusive "Neocera" base,** which permits rapid and complete absorption of the drug.

THREE DOSAGE FORMS
5 Gr. (green); 10 Gr. (blue);
15 Gr. (yellow). In Jars of 12.

WHAT IS "NEOCERA" BASE?
Contains no oils or fatty materials. Consists of bland, water-soluble Carbowaxes* with active dispersal agent. Breaks down in presence of fluids only, releasing medication completely and uniformly for total availability.
*Trade-mark U. C. C.

SUPPRETTE — SUCCESSOR TO THE SUPPOSITORY
Aspirin (rectal administration)
Aspirin w/secobarbital sodium
Gentian Violet (moniliasis)
Gentian 'E. V.' (pinworms)



THE WILLIAM A. WEBSTER CO.
Memphis 3, Tennessee

PROFESSIONAL SAMPLES AND LITERATURE AVAILABLE ON REQUEST

Announcing Fall-Winter Courses

of the

AMERICAN INSTITUTE FOR PSYCHOANALYSIS

HAROLD KELMAN, M. D., Dean

1. Training for psychiatrists who want to become certified to practice psychoanalysis.
2. Postgraduate orientation courses for physicians and psychiatrists.

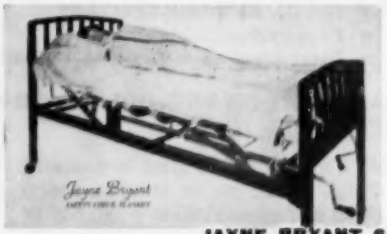
---

* The Psychoanalytic Relationship
Readings in Psychoanalysis. Part II. The Works of Freud
Workshop on Dynamics of Behaviour
* Continuous Case Seminar
Readings in Psychoanalysis. Part I. The Works of Karen Horney
Group Psychodynamics and Group Psychoanalysis
* Clinical Conferences
* Clinical Conferences
Clinical Conferences on Case Histories I

* Open to Matriculated Candidates only

For Information regarding requirements for admission, tuition, loan fellowships and curriculum, write to the Registrar: Miss Janet Frey, American Institute for Psychoanalysis, 220 West 98th Street, New York 25, N. Y.

HUNDREDS OF INSTITUTIONS NOW USE THE JAYNE BRYANT
SAFETY CHECK BLANKET



Sanforized canvas, launders easily. Ties securely to movable frame of hospital bed by ropes which pass through grommets spaced at eight-inch intervals. 75-inch zipper down center for quick access to patient. Additional zipper 30 inches long on either side of center zipper gives further accessibility. Two more openings permit patient's arms to be free when desirable. Zippers are strain-resistant and can be locked. Write, wire or phone.

JAYNE BRYANT SAFETY CHECK BLANKET
7610 S. EGGLESTON, CHICAGO 20, ILL. STewart 3-0140

ENTER NEW SUBSCRIPTIONS AND RENEWALS ON THIS FORM

AMERICAN JOURNAL OF PSYCHIATRY
1270 AVENUE OF THE AMERICAS, ROOM 310
NEW YORK 20, NEW YORK

..... 19 ....
Date

Enclosed herewith is $ ..... for one year's subscription to the AMERICAN JOURNAL OF PSYCHIATRY beginning with Volume ..... Number .....

NAME .....
Print

ADDRESS .....

SIGNATURE .....

Subscription $12.00 a year or by the Volume. Foreign Postage $1.00 extra. (New Volume began July 1955.)

IRURETAGOYENA SANATORIUM

Full resident an associate staff. Consultants in all specialties.

NERVOUS and MENTAL DISORDERS
ALCOHOLISM and DRUG ADDICTION
Modern Methods of Treatment

Buildings for care ELDERLY people. Moderate Rates.

References: The Chase National Bank of The City of New York, Havana, Cuba
DR. BERNABE IRURETAGOYENA, M. D.,
Psychiatrist resident and Director,
Member Cuban Neuropsychiatric Ass'n

Phone B0-9792
LISA, MARIANAO
Havana, Cuba.

ATTENTION

Extension of the reduced subscription rate of $5.00 (less than one-half the regular rate) for the AMERICAN JOURNAL OF PSYCHIATRY has been authorized to include medical students; junior and senior internes; first, second, and third year residents in training; and graduate students in psychology, psychiatric nursing, and psychiatric social work.

In placing your order, please indicate issue with which subscription is to start.

Send subscriptions to:

THE AMERICAN JOURNAL OF PSYCHIATRY
1270 AVENUE OF THE AMERICAS
NEW YORK 20, NEW YORK

BOOK MANUSCRIPTS INVITED

If you are looking for a publisher, send for our free, illustrated booklet titled *To the Author in Search of a Publisher*. It tells how we can publish, promote and distribute your book, as we have done for hundreds of other writers. All subjects considered. New authors welcomed. Write today for free Booklet AP.

VANTAGE PRESS, INC.
120 West 31st Street, New York 1
In Calif.: 6253 Hollywood Blvd., Hollywood 28
In Washington, D. C.: 1010 Vermont Ave., N.W.

HALL-BROOKE

An Active Treatment Hospital

A licensed private hospital devoted to active treatment, analytically-oriented psychotherapy, and the various somatic therapies.

A high ratio of staff to patients.

Large occupational therapy building with a trained staff offers complete facilities for crafts, arts and recreation. Full program of outdoor activities.

Each patient is under constant, daily psychiatric and medical supervision.

Located one hour from New York on 120 acres of Connecticut countryside.

HALL-BROOKE
Greens Farms, Box 31, Conn., Tel.: Westport, CApital 7-5105

George S. Hughes, M.D.
Leo H. Berman, M.D.
Alfred Berl, M.D.
Louis J. Micheels, M.D.
Robert Isenman, M.D.
Blanche Glass, M.A.
Mrs. Heide F. Bernard and
Samuel Bernard, Administrators

NEW YORK OFFICE: 46 E. 76th St., New York, N.Y., LEhigh 5-5155

ANCLOTE MANOR

A MODERN HOSPITAL FOR EMOTIONAL READJUSTMENT

Information Brochure Rates Available to Doctors and Institutions

- Modern Treatment Facilities
- Psychotherapy Emphasized
- Large Trained Staff
- Individual Attention
- Capacity Limited
- Occupational and Hobby Therapy
- Healthful Outdoor Recreation
- Supervised Sports
- Religious Services
- Ideal Location in Sunny Florida

MEDICAL DIRECTOR — SAMUEL G. HIBBS, M.D.
JOHN U. KEATING, M.D.
ASSOC. MEDICAL DIRECTOR — WALTER H. WELLBORN, Jr., M.D.
SAMUEL R. WARSON, M.D.

TARPON SPRINGS • FLORIDA • ON THE GULF OF MEXICO • PH. VICTOR 2-1811

BALDPATE, INC.

Georgetown, Mass.

Geo. 2131

Located in the hills of Essex County, 30 miles north of Boston

For the treatment of psychoneuroses, personality disorders, psychoses, alcoholism and drug addiction.

Psychotherapy is the basis of treatment; electric shock treatments, sub-coma and deep coma insulin therapy when indicated.

Occupation under a trained therapist, diversions and outdoor activities.

G. M. SCHLOMER, M. D.,
Medical Director

Founded 1879

RING SANATORIUM

Eight Miles from Boston

For the study, care, and treatment of emotional, mental, personality, and habit disorders.

On a foundation of dynamic psychotherapy all other recognized therapies are used as indicated.

Cottage accommodations meet varied individual needs. Limited facilities for the continued care of progressive disorders requiring medical, psychiatric, or neurological supervision.

Full resident and associate staff. Courtesy privileges to qualified physicians.

BENJAMIN SIMON, M. D.
Director

CHARLES E. WHITE, M. D.
Assistant Director

Arlington Heights, Massachusetts
MIssion 8-0081

Aldworth Manor

1 KEENE ROAD, HARRISVILLE, N.H. TELEPHONE 2

DR. HORACE G. RIPLEY
Consulting Psychiatrist

ANGELINE R. GILLIS, R. N.
Director

Twenty-four hour nursing care is provided by the nursing staff. This staff is selected and especially trained in geriatric care, management and rehabilitation. We operate under the supervision of the New Hampshire Department of Public Health.

We extend a cordial invitation to visit. A phone call or correspondence will provide complete information.

HIGH POINT HOSPITAL

PORT CHESTER, NEW YORK

WEstmore 9-4420

Emphasis is on analytically oriented psychotherapy, each patient receiving three to five therapeutic hours per week; ratio of one active psychotherapist for every five patients. Physiologic forms of treatment are available; therapy administered by attending psychoanalysts, and residents in advanced training under the immediate supervision of the director; staff of medical and surgical consultants (for psychosomatic studies) near New York City.

ALEXANDER GRALNICK, M.D., F.A.P.A., *Director*

WILLIAM V. SILVERBERG, M.D., F.A.P.A.
Chief Consultant in Psychotherapy

STEPHEN P. JEWETT, M.D.
Chief Consultant in Clinical Psychiatry

RUTH FOX, M.D., *Associate Consultant*

L. CLOVIS HIRNING, M.D., *Associate Consultant*

Attending Psychiatrists: STEPHEN W. KEMPETER, M.D.; MERVYN SCHACHT, M.D.

Associate Psychiatrists: LEONARD C. FRANK, M.D.; SYLVIA L. GENNIS, M.D.; LEONARD GOLD, M.D., F.A.P.A.; DANIEL L. GOLDSTEIN, M.D., F.A.P.A.; SIMON H. NAGLER, M.D.

Psychologists: LEATRICE STYRT SCHACHT, M.A.; MILDRED SHERWOOD LERNER, M.A.

Consulting Staff: Neurology, KENNETH M. GANG, M.D.; *Gynecology,* H. HAROLD GIBB, M.D., F.A.C.S.; *Surgery,* FRANK T. MASSUCCO, M.D., F.A.C.S.; *Internal Medicine,* NATHANIEL J. SCHWARTZ, M.D., F.A.C.P.; ARNOLD J. RODMAN, M.D., F.C.C.P.; *Dentistry,* IRVING J. GRALNICK, D.D.S.

The HAVEN SANITARIUM, INC.

ROCHESTER, MICHIGAN

M. O. WOLFE, M. D.
Director of Psychotherapy

JOHN D. WHITEHOUSE, M. D.
Clinical Director

GRAHAM SHINNICK
Manager

Telephone: OLive 1-9441

A psychoanalytically-oriented hospital for the diagnosis and treatment of mental and emotional illness.

Registered with A.M.A.

Member of American and Michigan Hospital Associations.

New Membership Directory Now Available

LIST OF FELLOWS AND MEMBERS OF THE AMERICAN PSYCHIATRIC ASSOCIATION 1954-1955

The new APA Membership Directory came off the press on October 1. Copies will be sent only on order. The charge is $1.00 a copy for Members of The American Psychiatric Association, and $2.00 for non-members. Please help facilitate distribution by enclosing payment with your order. Use order blank below.

Gentlemen: I enclose $..... for my copy of the new 1954-1955 APA Membership Directory.

Name .....

Address .....

.....

Mail to:

EXECUTIVE ASSISTANT
AMERICAN PSYCHIATRIC ASSOCIATION
1270 AVENUE OF THE AMERICAS, ROOM 310
NEW YORK 20, NEW YORK

THE ULTIMATE GOAL IS ADJUSTMENT OF THE "WHOLE CHILD"

The psychologic value of all aspects of treatment, training and education is carefully considered for each child at The Woods Schools. The ultimate goal is adjustment of the "whole child," physical, intellectual and social. Each child is taught to handle practical situations, acquire good work habits, accept responsibility, meet social situations, enjoy social experiences, and to function at the maximum of his or her ability as an individual and as a member of the group.

MEDICAL STAFF

Leslie R. Angus, M. D., Director of Psychiatric Services and the Child Research Clinic
William L. Noe, Jr., M. D., Director of Medical Services
Eugene B. Spitz, M. D., Neuro-Surgery Consultant

PSYCHOLOGICAL STAFF

Myrtle E. Wampler, M. A.
Fritz Stirner, M. A.
Kathryn Burchard, M. A.
Gisela Ungurian, M. A.
Paul M. Forest, M. A.
Frank P. Baker, Ph. D., Attending Consultant in Speech
Ruth M. Strang, Ph. D., Attending Consultant in Reading

Edward L. Johnstone,
President

THE WOODS SCHOOLS

A non-profit organization, founded in 1913

LANGHORNE, PENNSYLVANIA

d is for devotion

D is for Devereux Schools

DEVEREUX is devoted to psychiatric principles in the work of rehabilitating children.

Two-thirds of Devereux' units—or residential schools, which are geographically separated and self-contained—are designed for children of normal or superior intelligence who are suffering from emotional disturbance. Here, the Devereux plan of environmental therapy supplements formal analysis or other, traditional forms of treatment, while a full educational program ranges from prekindergarten through junior college.

We invite you to see for yourself, at any time, what the Devereux Schools are accomplishing as a result. Or, if you prefer, detailed information is available through the Department of Extension and Development in charge of

JOHN M. BARCLAY
Director of Development
Devereux Schools
Devon, Pennsylvania

THE DEVEREUX FOUNDATION

Devereux Schools

UNDER THE DEVEREUX FOUNDATION
Helena T. Devereux, Director

Santa Barbara, California — Devon, Pennsylvania